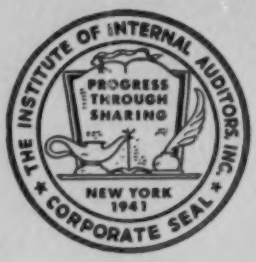
# THE INTERNAL AUDITOR

A PERIODICAL OF
THE INSTITUTE OF INTERNAL AUDITORS

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December 1956

Vol. 13 No. 4

# THE INTERNAL AUDITOR

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# THE INTERNAL AUDITOR

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VOL. 13 DECEMBER, 1956 NO. 4

## THE PRESIDENT'S PAGE

IN recent years, one of the great problems of industry has been the attraction and development of personnel. This shortage of trained personnel has been existent in virtually every field of endeavor, and particularly acute among the more technical management skills.

In time, shortages of personnel will be solved in much the same manner that any natural resource shortage is solved. Substitutes will be found through mechanization or automation. Marginal and sub-marginal jobs will be eliminated. More efficient methods will be developed to get higher yields from the same basic raw materials. In some cases the demand will be such that the atmosphere becomes very favorable for attracting an additional supply.

Under such conditions there are many problems to be met, and often some temporary compromise worked out as the best solution of the moment. There also exists during such periods an abundance of opportunity. It is an opportunity for individuals to demonstrate ingenuity and initiative at a time when it is needed most. It is an ideal time for self-improvement because added responsibilities are waiting for those who are capable.

Our national organization and local chapters are working diligently to encourage students to become interested in internal auditing. An even more effective way of calling attention to internal auditing as a field of opportunity is through the individual performance of internal auditors in their own companies. Superior performance, which in turn leads to individual recognition, is a most compelling stimulant to those who are contemplating their future career. It helps, immeasurably, to improve the stature of the entire profession in the process.

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# THE AUDIT OF OPERATIONS*

By O'FERRELL ESTES

General Auditor, Capital Airlines

*The success of internal auditing as an aid to management is dependent upon its extension into the field of operations. This talk deals with the nature and acceptance of this broadened concept of the internal audit.*

AS General Auditor of the company, I report directly to our Vice President and Treasurer. I am also a member of the Management Committee, which is composed of the elected officers of the company and other top management representatives. This group meets every two weeks for the purpose of formulating company policy and for approving the various programs and plans of the several departments.

The General Audit Division is divided into four separate sections or groups, with a supervisor for each section:

1. Internal Audit Section.
2. Field Audit Section.
3. Property Accountability Section.
4. Financial Management of the Vickers and Rolls-Royce Contracts.

## INTERNAL AUDIT SECTION

The Statement of Responsibilities of the Internal Auditor, which was issued by the Institute in 1947 provides that the chief overall objective of internal auditing is to "assist management in achieving the most efficient administration of the operations of the organization," and, to this, I would add: the most economical operation that can possibly be attained.

In its reference to internal auditing, the statement says: "It deals primarily with accounting and financial matters but it may properly deal with matters of an operating nature." It is with this latter phase of internal auditing that I should like to deal in this talk.

In Capital Airlines, circumstances have forced us to be ever vigilant for cost-saving programs. This may have caused those in our audit division to do certain things which some may not consider a proper audit function. Circumstances and personalities have, however, appeared to make this desirable for us, although your particular situation may not make it so for you.

*Delivered at a meeting of the Washington Chapter of THE INSTITUTE OF INTERNAL AUDITORS in Washington, D. C.

Independent public accountants are responsible for the verification and certification of the financial statements. While our work in the verification of balance sheet and certain income and expense accounts is performed in cooperation with them, it is of necessity subordinate to their work. However, if our work is to be of value, we must go beyond the mere verification of accounts and enter the field of inspection and appraisal of operations.

This raises the question: how do you get started in an operations audit? The answer is—such an audit may originate from the verification of the accounts; it may be part of our regular audit program, or it may come from special assignments.

We all do more auditing of operations than we realize. Perhaps some examples, which I consider in the category of audit of operations in Capital Airlines will prove this theory, or, at least generate some interest in this direction:

1. When we audit the cash accounts, we are of course interested in a complete and accurate verification, but we are also interested in cash management policies, and how effectively they are carried out. Is unemployed cash properly and adequately invested? Are we experiencing unnecessary bank charges in certain accounts? Are the operating controls adequate to insure maximum protection of company funds, etc.?
2. When we make direct confirmation of accounts receivable, we are, of course, interested in the accuracy of the amounts, but we are also keenly interested in the comments and criticisms which may be written on the confirmations returned by the customers. The type of service we offer may cause some dissatisfaction among our customers, and investigation of these complaints will lead to corrective action that should improve the entire operation. From another viewpoint, when we age the accounts receivable, we are interested in collection practices, the follow-up procedures for old and slow-moving accounts, etc.
3. We supervise the taking of inventories and make the necessary audit reconciliations, but we are more interested in the character of our inventories. We concern ourselves with the reorder policy and procedures—the relative size of the investment in inventories—the treatment of obsolescent items, and the general management of the inventories. In a recent period, our analyses, recommendations, and follow through led to a reduction in our investment in inventories of almost one million dollars.
4. We have, upon request, made special surveys of departments within the company. This has involved personal interviews, which in one

case involved almost a hundred people. The purpose of this was to learn from them what they considered wrong with the organizational set-up, supervision, procedures, office arrangement, general working conditions, etc. In this manner, they became part of the survey and interested in the results. At the same time, we were evaluating the employee's ability, efficiency, and production performance. Also important, we were looking for potential supervisors. As a consequence of this survey, we reorganized the department re-arranged the office set-up and changed procedures where necessary. Supervision was improved, yet, at the same time, we saved the company more than $25,000 annually in salary expense.

5. We have made special surveys of the purchasing department, with particular reference to the organizational structure, as well as its operating practices and procedures. We were concerned in learning whether our buyers were merely order-placers, or were shopping round for the best buys. We also concerned ourselves with their scheduling of purchases, and whether it resulted in the maintenance of minimum inventories, and the conservation of our available cash reserve.

6. In the audit of advertising expense, we are, of course, concerned with the verification of the charges, but we are also interested in seeing to it that the company has gotten its money's worth. We look at an advertisement to see if the particular periodical has placed the advertisement where we want it; we also look for apparent duplication of advertising coverage. After completion of this audit, we discuss our findings with the advertising manager on a personal basis.

7. You may think this strange, but I am personally charged with the responsibility for controlling all capital expenditure requirements of the company. This means that all departments have to satisfy me first that their particular requirement is essential to efficient operation. It may be an expensive piece of technical shop equipment, or it may be the construction of a hangar, an engine test cell, or something similar. I approve and process capital expenditures up to a certain limit, and submit all other expenditures to management for approval. In the event I disagree with any expenditure, my point of view is

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*Mr. Estes has served as Chairman of the National Admissions Committee, as Regional Vice President, Middle Atlantic Region and President of the Washington Chapter of* THE INSTITUTE OF INTERNAL AUDITORS. *He is at present National Secretary of* THE INSTITUTE.

included in the report. The larger expenditures are submitted subsequently to the Board of Directors for approval.

## FIELD AUDIT SECTION

Our field audit program is designed to make the usual verification of cash, accounts receivable, ticket inventories, etc., but we enter into the audit of operations in the following ways:

1. The efficiency of the organizational structure and the supervision of the operation under review is first examined. We have on many occasions made recommendations, which have been accepted, for the consolidation of operating functions to allow for greater utilization of employees and to improve supervision. For example, we proposed the relocation of telephone sales offices into the city ticket office areas, so that during slack periods (within the twenty-four hour coverage period) we would require a minimum number of employees to cover both functions, with a corresponding reduction in staff requirements.
2. Our examination and appraisal of prevailing conditions in a particular city have sometimes led to the abolishment of sales offices as not being economically advisable.
3. Our field auditors, when traveling the line in their regular tour of duty, are expected to observe the passenger service offered by the hostesses. They also determine that the food menu is in accordance with that scheduled for the particular trip, and that the quality of the food is satisfactory.
4. Our audit program requires the field auditors to telephone the reservations office of the operation under review and make a reservation, for the purpose of confirming that the agent is a good salesman, and not just an order taker. The results are then reviewed with the local manager and reported to the headquarters staff. This information is used for supervision and training purposes.
5. Our auditors have been requested by our Vice President of Sales to report on the general physical appearance of sales offices as well as the appearance of local employees.
6. We review and report on the general condition and appearance of ground equipment, maintenance standards, replacement requirements, etc.
7. In still another field, our analyses revealed that we were incurring an unnecessary expense in placing more meals aboard our airplanes than were being consumed by the passengers. This caused us to recommend a change in policy, which was adopted, resulting in an

improvement in the ratio of meals ordered to meals consumed, with a substantial reduction in expense.

## INCREASE IN AUDIT FUNCTIONS

We are constantly receiving requests from our operations people to perform audits. Some of these come to me through the President of our company, and some directly. The increase in the number of these requests, and the greater frequency of our audits of operations attests to the success of our broadened program of audit.

# THE APPLICATION OF STATISTICAL SAMPLING TECHNIQUES TO AUDITING

By E. W. GAYNOR

United States Army Audit Agency

*A common fear of statistical sampling is that it substitutes mathematics for judgement. The fact is that—properly applied—the statistical approach improves the ability to make a considered judgment and decision.*

*The author outlines the methods by which sampling enables the auditor to reach the point of decision sooner and with greater confidence than with other methods of testing.*

STATISTICAL sampling techniques have been an accepted tool of industrial management in product quality control for many years. Recently, numerous applications have been developed in industrial and commercial organizations for the quality control of paper work. At this point however, auditing stands somewhat at the cross-roads concerning the use of these techniques. Considerable progress has been made but some skepticism still exists regarding the value of using new or unconventional methods. The science of prediction has, however, been advanced to such a degree that it can profitably be employed in auditing and accounting situations. It is the purpose of this paper to illustrate and describe some of the applications of statistical sampling technique that are currently being used in the field of auditing.

## THE CURRENT SITUATION

Test checking and selective testing have been used in auditing for many years. Few people today would insist on 100% audits. Current practice, however, is in many cases solely governed by the concept of "materiality." In determining sample size or the type of sample to be drawn, the auditor in most cases must depend "on judgement born of experience"; a criterion that at best is very difficult if not impossible to evaluate. Further such criterion has no provision for adequately incorporating such concepts as risk, probability, or protection desired; all very necessary elements of a logical sampling procedure. Apparently the results of our efforts have been acceptable enough, but have they been as good as they might have been?

## STATISTICAL SAMPLING

Statistical sampling is essentially a scientific method of prediction. A sample is drawn; on the basis of the information produced by the sample an

inference is made concerning the characteristic being measured; and finally a conclusion is drawn concerning the attributes of the entire group or lot from which the sample was selected. It is thus a scientific expression of logical thinking. To achieve this the sampling plan must in some degree provide information concerning the variation of one item from another. If all items in a given work-lot were identical, the examination of one item would provide sufficient information on which to draw a conclusion concerning the entire lot. The difference between haphazard or unsystematic test checking or sampling and statistical sampling is primarily the fact that the latter, because it recognizes elements of risk, protection desired, and probabilities involved, measures the degree of variation that can be expected under given conditions. The paragraphs that follow will show how this is accomplished.

## BENEFITS OF STATISTICAL SAMPLING

The consideration of any new plan or procedure must of course reflect the possible benefits that may accrue. So it is with statistical sampling. Generally speaking the use of this technique will accomplish the following:

1. It encourages the preparation of a pre-determined acceptable standard.
2. It measures variations from that standard.
3. Because it measures variations, it provides information as to their cause, and thus the necessary tool to control them.
4. It can provide this information on a continuing basis and at minimum cost.

## A FEW BASIC STATISTICAL CONCEPTS

Before further discussing the use of statistical sampling plans, it is necessary that a few basic concepts be reviewed and defined. Since all of these concepts are adequately covered in various statistical texts, no attempt will be made to prove their existence or reasonableness. At this stage in the development of the science of prediction, the existence and performance of these concepts is hardly a point at issue.

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## RISK

Any type of sampling plan or procedure for test checking involves some risk of making improper decisions concerning the quality of the data being examined. If we were willing to take no risk, we would be forced to resort to 100% auditing; and even then the incidence of error would not be fully precluded. Tests have shown that 100% audits or examinations do not necessarily present the most reliable results. Elements such as boredom, fatigue, and repetition tend to detract from the reliability of such 100% examinations.

Sampling plans designed without benefit of statistical principles lack a conscious evaluation of the element of risk. While the auditor using an unsystematic sampling plan, may in a remote manner evaluate this element, he has no tangible way in which to reflect this consideration in the plan itself. He must of necessity feel his way as well as he is able.

Assume in a given situation that we are willing to accept an error of 1%. If we were to recognize no risk in using a sampling plan, we would be forced to examine substantially all of the work-lot. If however, we recognize the probability that once in twenty times we may conclude that the entire work-lot is more than 1% defective, when in reality it is less than 1% defective; and that once in ten times we may conclude that the work-lot is less than 1% defective when in reality it is more than 1% defective, we have established definite risk limits. In other words we recognize that we may at times come to incorrect conclusions, but place definite limits on the extent of such erroneous conclusions that we are willing to tolerate.

Risk then is the relative assurance that we can expect to have concerning the accuracy of our decisions when sampling work-lots of a given quality. The assurance or risk level may be set as high as desired. Of course, as the assurance level approaches 100%, the sample size also increases, and a point of diminishing returns is reached. The level at which the assurance level is finally set depends to a great degree on experimentation, the relative importance of error, and a fine balance between possible results and probable error.

## ACCEPTABLE QUALITY LEVEL

Admitting the impracticability of absolute perfection may be difficult for accountants, but it is generally conceded, however, that where large lots of accounting data are involved absolute accuracy is practically impossible. If the relative quality of accounting data is to be evaluated, it becomes important to set a degree of error which will be considered acceptable; otherwise the purpose of the evaluation will be an undefined goal. This acceptable degree of error we shall define for our purpose as the Acceptable Quality Level, and it or its equivalent is necessary for the design of any logical sampling plan. This concept of acceptable error is a point of great difference

between the unsystematic plan and the statistical plan. The former gives no positive recognition to an Acceptable Quality Level while the latter makes it an integral part of the plan itself.

## PROBABILITY

Probability in the language of statistics, is the relative frequency with which we can expect an event to occur in the long run. In its practical application it provides us with the tool which predicts our chances of selecting an item with an error from a given work-lot based on the average number of errors in the work-lot. A little reflection on the benefits to be derived from the application of the law of probability will convince even the skeptic that, when incorporated into the design of sampling plans, it provides perhaps the single most important requirement of successful sampling; that is, the ability to predict our chance of selecting an item with an error as well as the ability to predict the relative quality of a work-lot based on the observation of a given sample.

## VARIABILITY, THE FREQUENCY DISTRIBUTION, AND THE STANDARD DEVIATION

As stated previously, if every item in a given work-lot were identical, the examination of any one unit would give an adequate estimate of the entire lot. It is a known fact however, that all things natural or artificial differ from each other if only in a minute way. The degree to which they differ governs to a great degree the size and type of sample required to arrive at an adequate estimate of the parent group. The objective of a statistical approach is to provide a sample of sufficient size and possessing proportionately the same characteristics as the work-lot from which it is selected.

When charted, the variability of different types of data will produce curves of varying dimensions. In statistical sampling our interest lies in what is commonly called the normal curve or distribution. The simplest description that can be given is that when charted as a curve it approximates the shape of a bell; technically it is an approximation of the binomial distribution. As we shall see later it is essentially a method of implementing the law of probability.

The basis for the graphic representation of the variability of data is the frequency distribution. It may be defined as an orderly array or presentation of a series of measurements by logical segments of variability. Thus in Figure 1 (page 21), there is illustrated the frequency distribution of 100 samples of 100 each from a work-lot of 1,000 invoices that contained 40 defective invoices. This distribution, even though it is somewhat skewed, approximates the normal sufficiently, so that we can make use of the known properties of the normal curve for purposes of prediction.

Figure 2 (page 21) presents the same frequency distribution as a graphic curve. The value in knowing that the results of sampling will fall into this pattern lies in the fact that since we know the properties of the normal curve, we can predict the expected incidence or behavior of other similar samples. The device for accomplishing this is called the standard deviation.

The standard deviation can be defined as the basic measurement of dispersion about the average. It can be proven that in any normal distribution, or one that closely approximates it, there will be the following dispersion of data about the average.

68. % of the data will fall within + or — one standard deviation.
95. % of the data will fall within + or — two standard deviations.
99.7% of the data will fall within + or — three standard deviations.

The principal value to be derived from the use of this measurement is its ability to disclose where most of the data would fall under normal circumstances. Thus, if it is known (or estimated) that the average percent defective of a given work-lot is 4%, and the standard deviation of the measurements is 1.5, it can be concluded that 99.7% of the expected samples will fall between 0 and 8.5% defective. This is graphically illustrated in Figure 2. There we have indicated the 1, 2, and 3 sigma limits for the 100 samples referred to above. A tabulation of the 100 samples indicated that on the average the work-lot was 3.9% defective; this is almost unbelievably close to the true percentage defective of 4%. The standard deviation for this group of samples was computed and found to be 1.9. With this information we could predict that in the long run, and as long as no other outside influence was injected, future samples from this work-lot would fall within the following limits:

68. % of the samples would fall between 2 and 5.8 defects per 100.
95. % of the samples would fall between .1 and 7.7 defects per 100.
99.7% of the samples would fall between —1.8 and 9.6 defects per 100.

Thus, if any given sample indicated as many as 9 defective invoices out of a sample of 100, we could conclude that such a sample might have been selected from a work-lot that was no more than 4% defective.

Comparison of the above limits with the observations in Figure 1, indicates that of the one hundred samples drawn, more fell into the one and two sigma limits than anticipated. This is primarily due to the fact that as a basis for approximating the normal distribution, 100 samples are not a large group of observations. As the number of samples would be increased, both the frequency distribution and the charted curve would tend to more closely approach the normal.

## OPERATING CHARACTERISTIC CURVE

The operating characteristic curve (abbreviated OC Curve) is really a blueprint of a sampling plan. It shows for any given fraction or percent defective in a submitted work-lot, the probability that such a work-lot will be accepted by the specified sampling plan. Thus, through the combined use of the OC Curve and the law of probability, we can prove the fallacy of fixed percentage samples. Assume that all work-lots are 5% defective and that the established practice calls for a 10% sample. Selecting samples in this way will result in the following:

| Size of Work-lot | 10% Sample | Submitted Work-lots Which Are 5% Defective—Will Be Accepted Indicated % of the Time |
|---|---|---|
| 1000 | 100 | 1% |
| 200 | 20 | 37% |
| 100 | 10 | 60% |

The above indicates how fallacious the idea of fixed percentage samples really is. Based on the facts outlined, 5% defective lots would be accepted from 1% to 60% of the time. While the foregoing disproves the fixed percentage theory, it also proves the fact that from the standpoint of quality protection the absolute size of a random sample is much more important than its relation to the work-lot.

## APPLICATION OF STATISTICAL SAMPLING PLANS TO AUDITING

The previous discussion of the various statistical concepts leads us to our ultimate objective; that is practical application. With a thorough knowledge of these concepts and principles any of us could design and develop statistical sampling plans to fit our needs. This however, becomes time consuming and at times slightly burdensome. Fortunately there are plans already designed which we can appropriately use.

This phase of the discussion will be limited primarily to situations where the purpose of an audit is the desire to determine that a given system is being followed. It has as its basis the concept of the controlled process—controlled in the statistical sense—that is, we expect only chance errors. Any deliberate attempt to introduce error or change will throw the process out of control. The accounting system has presumably been properly designed and installed. So long as the data entering that system is being processed according to the designed plan, the result can be nothing but acceptable. Within that system however, there are numerous opportunities for error. The object of the audit is to determine the extent of these deviations and evaluate their effect upon the operation. With this concept, opportunities for error may be considered in determining sample size rather than absolute numbers of invoices,

vouchers, etc. The decision as to which should be used can be made depending upon the circumstances in the case.

Table I (page 22) presents a collection of single sampling plans which have been used by the writer during the past few years. The plans have been employed in situations where the size of the work-lot is readily ascertainable, that is the work-lot is finite. The Table really serves two purposes. First, it provides a basis for selecting a desirable sampling plan, and second, after the sample has been audited it serves as a basis for predicting the probable quality of the work-lot from which the sample was drawn. To illustrate; assume a work-lot of 10,000 items and an Acceptable Quality Level of .035%. The Table indicates that for the AQL specified a sample of 225 items should be selected at random. We further find that in the audit of the sample we must discover no errors in order to be certain of maintaining the specified AQL. Turning to Table I (a) (page 23) we locate the OC Curve for the sampling plan selected and find that under the circumstances we would be accepting lots that are .035% defective about 95% of the time and that 5% of the time we would be accepting lots that are as much as 1.37% defective. If we feel that this indicated risk is either too high or too low, we can review the OC Curves of other plans and select one that appears to better suit our needs. Assume now that we audited the 225 items and found 5 errors. Since the Table provides for an acceptance number of no errors for an AQL of .035%, we know that the sample indicates that the work-lot does not meet our standard. Reading from the Table however, to the point where 5 errors indicate acceptance, we find that 5 errors out of a sample of 225 indicate an AQL of 1%. We can thus predict that based on the audit of the sample the work-lot contains error equal to an AQL of 1%.

Table II (page 24) presents the acceptance points for a series of Sequential Sampling Plans. These plans have been developed and used by the writer primarily where the size of the work-lot is not readily ascertainable, (that is where the work-lot can be considered infinite) and in situations where a very low degree of error is acceptable.

In the Sequential Sampling Plans the AQL is expressed as a range of acceptable error. Thus $p_1$ represents the ratio of acceptable error, while $p_2$ designates the point beyond which error cannot be tolerated under the given circumstances. As indicated on the Table, a and B represent the values assigned to the risk of making improper decisions when either $p_1$ or $p_2$ is a fact. A review of the selected OC Curves presented in Table II (a) (page 25) indicates that when a = .05 and B = .10, lots containing error equal to $p_1$ will be accepted 95% of the time, while lots bearing error equal to $p_2$ will be accepted 10% of the time. This definite indication of the protection afforded and the assurance with which it can be accepted is an extremely important characteristic that makes the use of Sequential Sampling Plans so adaptable to auditing.

Table II like Table I can be used both as a basis for selecting a sampling plan as well as the means of predicting the estimated quality of a given work-lot. Assume that for a given audit we establish $p_1$ at .005 and $p_2$ at .01. Referring to Table II we find that the minimum random sample is 447. If we select and examine the sample and find no errors we can be satisfied that the work-lot meets the prescribed standard. If however, we should find 1 error, we would have to examine an additional 138 items (585-447) and find no additional error in order to be satisfied that the work-lot meets the desired quality standard. If however, we should find 4 errors and did not immediately wish to examine the additional 554 items (1001-447) we could go to Table II and by finding a sample size as close as possible to 447, under the column for 4 defects, predict the approximate quality of the work-lot from which the sample was drawn. Reading down the column for 4 defects we find that a sample size of 440 is as close as we can approach 447, and that the parameters of this plan are $p_1 = .0025$ and $p_2 = .03$. We can thus conclude that the work-lot from which the sample was selected closely approximates the quality indicated by the parameters of the indicated plan. At this point we can make a decision to draw further samples or conclude that the quality indicated is satisfactory.

## CONTROLLING DOLLAR ERROR

So far we have discussed only the control of the number of errors. Numerous occasions arise however, where it is desirable to control the dollar amount of error.

The most general procedure utilized is to assume that the entire work-lot contains the same ratio of dollar error as that indicated by the sample. The real difficulty with this approach is the fact that most groups of accounting data vary widely in the dollar amount of the individual items. We may state that in a work-lot of $1,000,000.00 we are willing on the average to accept .5% error. However, there is considerable difference in the absolute dollar amount between a .5% error on a $10.00 invoice and on a $50,000.00 item. In other words the variability of dollar error seriously complicates the situation. We shall discuss several ways of minimizing this problem.

A sample drawn at random will be a close approximation of the work-lot. Figure 3, (page 26) illustrates the actual distribution by dollar value of 1747 invoices, as well as the distribution obtained by selecting a random sample. (This is an actual case.) Comparing columns 3 and 5 we find that the random sample is a reasonable approximation of the lot. Generally speaking where a sample is selected at random, it is so representative of the work-lot that the chance errors that are discovered should be a reasonable indication of the quality of the entire work-lot. Thus random selection is the most elementary tool for minimizing the variability of dollar error.

Another method that can be of use in the control of dollar error is stratified sampling. Most groups of accounting data can be divided or classified by dollar value. In stratified sampling the data is first divided into several dollar classes; the sample is drawn proportionately from each strata; and a ratio of dollar error computed for each. If a sample indicates that dollar error for any one strata appears greater than we wish to tolerate, a decision can be reached concerning the course of action to be taken.

The final method is discussed and the one considered the most reliable is the use of the $\overline{X}$ and R charts. These charts measure the deviations from a given standard and offer a technique to determine whether the measurement being analyzed indicates a situation that is either "in control" or "out of control." By control in this case we mean statistical control, *i.e.* if the variability of our measurements is due to numerous causes, as found in a normal distribution, we are in control. If, on the other hand, the variability is due to large assignable causes, the process is out of control and we can begin to investigate the cause for this situation. The $\overline{X}$ Chart measures the variability of the averages, and the R Chart measures the variability of the range within a given sample.

The subject of control charts is very well presented in "Statistical Quality Control" by E. L. Grant. Application of the technique to cost situations was discussed in two articles in the June 1954 issue of the N.A.C.A. Bulletin. The first "Calculating Control Limits for Cost Control Data" by C. E. Noble, and the second "Use of Control Charts in Cost Control" by the author of this article. However, this illustration is presented to show the application of the Control Chart technique to the control of dollar error.

Figure 4, (page 26) presents the results of 10 samples of 5 items each as well as the calculation of control limits for the average and the range. This same information is plotted on cross section paper in Figures 5 and 6 (page 27). The 10 samples were initially taken to provide data from which a control pattern could be established. It can be noted immediately that samples 3 and 9 indicate that the range is out of control. This means that something is happening within the process which causes errors to occur in larger dollar amounts than could be expected if only chance causes were operative. Investigation uncovered the causes for the out of control situation and corrective action was taken. As future audits were performed, the results of the audit of each sample were plotted, and each time an out of control situation was indicated, necessary action was taken to determine the underlying cause.

An interesting observation in connection with this example is the fact that the audit revealed a total error of $16.72 for 50 invoices or $.3344 per invoice. As an overall average this was quite acceptable; however, it gave us

no information concerning the range of individual errors or the magnitude of the errors that contribute to the average. The 3 sigma control limits that were established, told us where we could expect 99.7% of the data to fall providing the situation remained reasonably constant in comparison with the initial 10 samples.

This technique offers an excellent method for control in situations where audits are being performed frequently or on a continuous basis. It highlights those situations which are causing an excessive amount of error but which are completely lost in the computation of averages only. It offers an opportunity to reduce the amount of error, even though in absolute terms it may be acceptable under current standards.

## GENERAL CONSIDERATIONS

It must be emphasized that the applications described are not mere philosophical musings. They have and currently are being used as a tool to assist the auditor in drawing proper inferences and conclusions, but in no event are they to be considered substitutes for true judgment. The term judgment, however, is often merely a reflection of our inability to give a firm opinion or directive. All too often we tell an auditor to "use your judgment in selecting the sample," when we really meant to say "I honestly don't know how large the sample should be, how it should be selected, or how much error we can tolerate, but we have to finish this job, so do the best that you can." If this is judgment, then statistical sampling is certainly a very good substitute for it. However, true judgment is defined as "the power of making a proper decision," and is required in everything that we do. There is therefore, little ground for the fear that the use of statistical sampling techniques will make mere mathematical computers of accountants. If nothing else it will give us an excellent means for justifying our conclusions. The statistical approach merely highlights the point at which a decision must be made, and in no way implies only the choice between acceptance or rejection. In auditing we really cannot reject a work-lot; we must either accept it, re-work it, or adjust it. By employing the methods discussed we can reach the point for making a decision sooner and with greater confidence than under unsystematic sampling or test checking. In attempting to reach these decisions it often happens that two or more auditors will come to conflicting decisions based on facts revealed by a given sample. Statistical inference is extremely valuable in such cases, for it can objectively evaluate the results in terms of the risk, the probabilities involved, as well as other attending factors and point the way toward a logical conclusion. Use and experimentation will refine these techniques to the point where they can become part of the accountant's basic equipment.

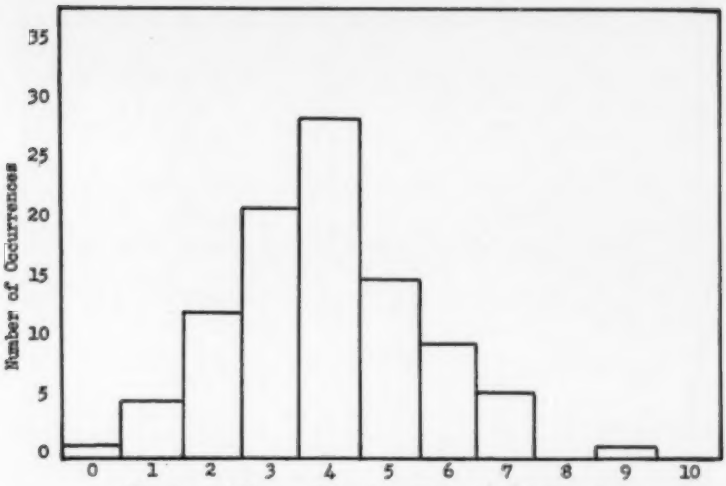



Fig. 1. Frequency distribution of 100 random samples drawn from a work-lot of invoices which was 4% defective.

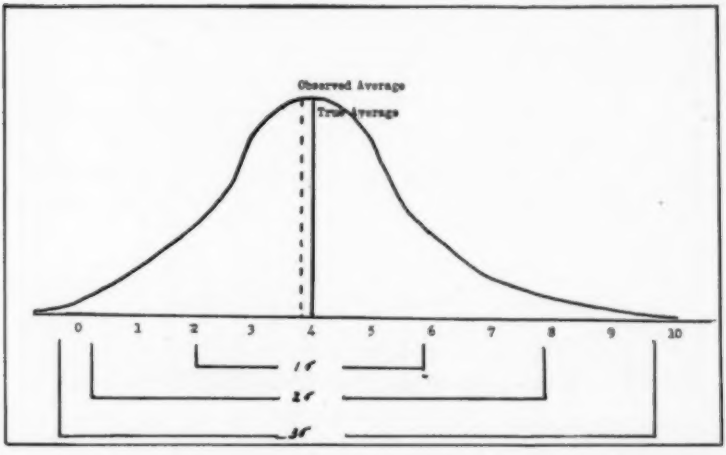



Fig. 2. The normal curve; with 1, 2, and 3 sigma limits indicated for frequency distribution in Fig. 1.

TABLE I
Acceptance Points
For Selected Single Sampling Plans

| Work Lot Size | Sample Size | Acceptable Quality Level (Percent Defective) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | .015 | .035 | .065 | .10 | .15 | .25 | .40 | .65 | 1.0 | 1.5 | 2.5 | 4.0 | 6.5 |
| 2 to 40 | 3 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ |
| 41 to 65 | 5 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ |
| 66 to 110 | 7 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ |
| 111 to 180 | 10 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 |
| 181 to 300 | 15 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 |
| 301 to 500 | 25 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 |
| 501 to 800 | 35 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 | 5 |
| 801 to 1300 | 50 | ↓ | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 | 4 | 6 |
| 1301 to 3200 | 75 | ↓ | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 | 4 | 6 | 9 |
| 801 to 1300 | 110 | ↓ | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 | 4 | 6 | 8 | 12 |
| 3201 to 8000 | 150 | ↓ | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 | 4 | 5 | 8 | 11 | 17 |
| 8001 to 22,000 | 225 | ↓ | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 | 4 | 5 | 8 | 11 | 17 | 24 |
| 22,001 to 110,000 | 300 | 0 ↑ ↓ | ↓ | ↓ | 1 | 2 | 3 | 4 | 5 | 7 | 10 | 14 | 20 | 32 |
| 110,001 to 550,000 | 450 | ↓ | ↓ | 1 | 2 | 3 | 4 | 5 | 7 | 10 | 14 | 20 | 29 | 43 |
| 550,001 and over | 750 | ↓ | 1 | 2 | 3 | 4 | 6 | 8 | 11 | 15 | 20 | 31 | 45 | 68 |
| 550,001 and over | 1,500 | 1 | 2 | 3 | 5 | 7 | 9 | 13 | 18 | 25 | 35 | 56 | 81 | 124 |

V Use first sampling plan below arrow.
Λ Use first sampling plan above arrow.
OC Curves for selected sampling plans are presented in Table I (a).

Description and outline for use of this chart found on pages 17 and 18.

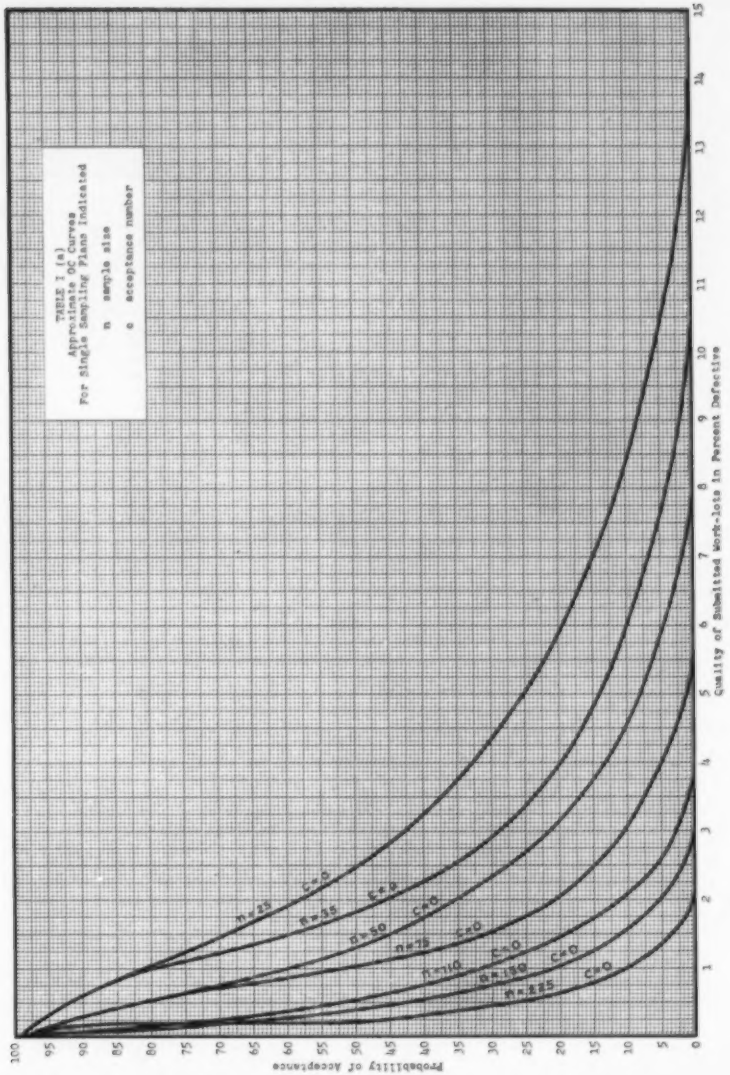


TABLE I (a)
Approximate OC Curves
For Single Sampling Plans Indicated
n sample size
c acceptance number
n=25 c=0
n=35 c=0
n=50 c=0
n=75 c=0
n=110 c=0
n=150 c=0
n=225 c=0
Probability of Acceptance
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
Quality of Submitted Work--Lots in Percent Defective
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Description for use of this graph found on pages 17 and 18.

TABLE II
ACCEPTANCE POINTS
FOR SEQUENTIAL SAMPLING PLANS

$p_1$ and $p_2$ INDICATED  $\alpha = .05$  $\beta = .10$

| No. of Defects Found | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $p_1$ | $p_2$ | SAMPLE SIZE | | | | | | | | | |
| .01 | .07 | 37 | 68 | 100 | 132 | 165 | 197 | 229 | 261 | 292 | 325 |
| .0025 | .06 | 38 | 92 | 146 | 201 | 255 | 311 | 365 | 419 | 474 | 528 |
| .15 | .20 | 38 | 43 | 48 | 54 | 60 | 65 | 71 | 77 | 83 | 88 |
| .005 | .06 | 40 | 84 | 129 | 174 | 218 | 263 | 307 | 353 | 398 | 443 |
| .10 | .15 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 |
| .05 | .10 | 42 | 55 | 69 | 83 | 97 | 111 | 124 | 138 | 152 | 166 |
| .02 | .07 | 43 | 68 | 93 | 118 | 143 | 168 | 192 | 217 | 242 | 267 |
| .03 | .08 | 43 | 63 | 82 | 102 | 121 | 141 | 160 | 180 | 199 | 219 |
| .04 | .09 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 156 | 172 | 188 |
| .01 | .06 | 44 | 79 | 115 | 150 | 186 | 221 | 257 | 292 | 328 | 364 |
| .20 | .24 | 44 | 48 | 53 | 57 | 62 | 66 | 71 | 75 | 80 | 84 |
| .0025 | .05 | 47 | 109 | 161 | 233 | 285 | 358 | 420 | 472 | 545 | 597 |
| .005 | .05 | 49 | 99 | 150 | 201 | 252 | 302 | 353 | 404 | 455 | 505 |
| .10 | .14 | 50 | 58 | 66 | 75 | 83 | 92 | 100 | 108 | 117 | 125 |
| .05 | .09 | 53 | 67 | 82 | 96 | 111 | 126 | 140 | 155 | 170 | 184 |
| .04 | .08 | 53 | 70 | 87 | 104 | 122 | 139 | 156 | 173 | 191 | 208 |
| .03 | .07 | 54 | 75 | 96 | 117 | 138 | 160 | 181 | 202 | 223 | 244 |
| .01 | .05 | 55 | 94 | 135 | 174 | 215 | 255 | 295 | 335 | 375 | 415 |
| .02 | .06 | 55 | 82 | 110 | 137 | 164 | 192 | 219 | 246 | 274 | 301 |
| .0025 | .04 | 59 | 132 | 205 | 279 | 352 | 425 | 498 | 572 | 645 | 719 |
| .005 | .04 | 63 | 122 | 181 | 240 | 299 | 358 | 417 | 476 | 535 | 594 |
| .10 | .13 | 67 | 75 | 84 | 93 | 101 | 110 | 119 | 128 | 136 | 145 |
| .04 | .07 | 71 | 89 | 108 | 126 | 145 | 164 | 182 | 201 | 219 | 238 |
| .05 | .08 | 71 | 86 | 102 | 117 | 133 | 149 | 164 | 180 | 196 | 211 |
| .03 | .06 | 72 | 95 | 118 | 141 | 164 | 187 | 210 | 233 | 256 | 279 |
| .02 | .05 | 73 | 103 | 133 | 164 | 194 | 225 | 255 | 286 | 315 | 346 |
| .01 | .04 | 74 | 119 | 165 | 211 | 256 | 303 | 349 | 395 | 441 | 486 |
| .0025 | .03 | 81 | 170 | 260 | 350 | 440 | 530 | 620 | 710 | 799 | 889 |
| .005 | .03 | 89 | 160 | 231 | 303 | 374 | 446 | 517 | 588 | 660 | 731 |
| .05 | .07 | 106 | 122 | 139 | 156 | 173 | 190 | 206 | 223 | 240 | 257 |
| .04 | .06 | 107 | 127 | 147 | 167 | 188 | 208 | 228 | 248 | 269 | 289 |
| .03 | .05 | 109 | 135 | 160 | 185 | 211 | 237 | 262 | 288 | 313 | 339 |
| .02 | .04 | 110 | 145 | 179 | 214 | 248 | 283 | 318 | 352 | 387 | 421 |
| .01 | .03 | 111 | 165 | 220 | 275 | 330 | 384 | 439 | 494 | 555 | 604 |
| .0025 | .02 | 128 | 246 | 364 | 482 | 600 | 719 | 838 | 956 | 1075 | 1193 |
| .005 | .02 | 149 | 240 | 333 | 425 | 517 | 609 | 702 | 794 | 886 | 978 |
| .0025 | .015 | 179 | 322 | 465 | 608 | 751 | 893 | 1037 | 1180 | 1323 | 1466 |
| .03 | .04 | 218 | 247 | 275 | 304 | 333 | 362 | 391 | 419 | 448 | 477 |
| .02 | .03 | 220 | 260 | 301 | 341 | 382 | 422 | 463 | 503 | 544 | 584 |
| .01 | .02 | 222 | 291 | 360 | 429 | 499 | 568 | 637 | 706 | 776 | 845 |
| .005 | .015 | 223 | 332 | 441 | 552 | 661 | 771 | 881 | 991 | 1101 | 1211 |
| .0025 | .01 | 299 | 483 | 668 | 852 | 1037 | 1222 | 1406 | 1591 | 1776 | 1960 |
| .001 | .007 | 374 | 698 | 1022 | 1346 | 1670 | 1994 | 2318 | 2642 | 2966 | 3290 |
| .005 | .01 | 447 | 585 | 724 | 862 | 1001 | 1140 | 1279 | 1416 | 1555 | 1694 |
| .0025 | .0075 | 449 | 667 | 887 | 1106 | 1326 | 1546 | 1766 | 1985 | 2205 | 2424 |
| .001 | .005 | 562 | 963 | 1365 | 1767 | 2169 | 2571 | 2974 | 3376 | 3778 | 4180 |
| .001 | .004 | 749 | 1210 | 1672 | 2134 | 2596 | 3057 | 3518 | 3981 | 4444 | 4905 |

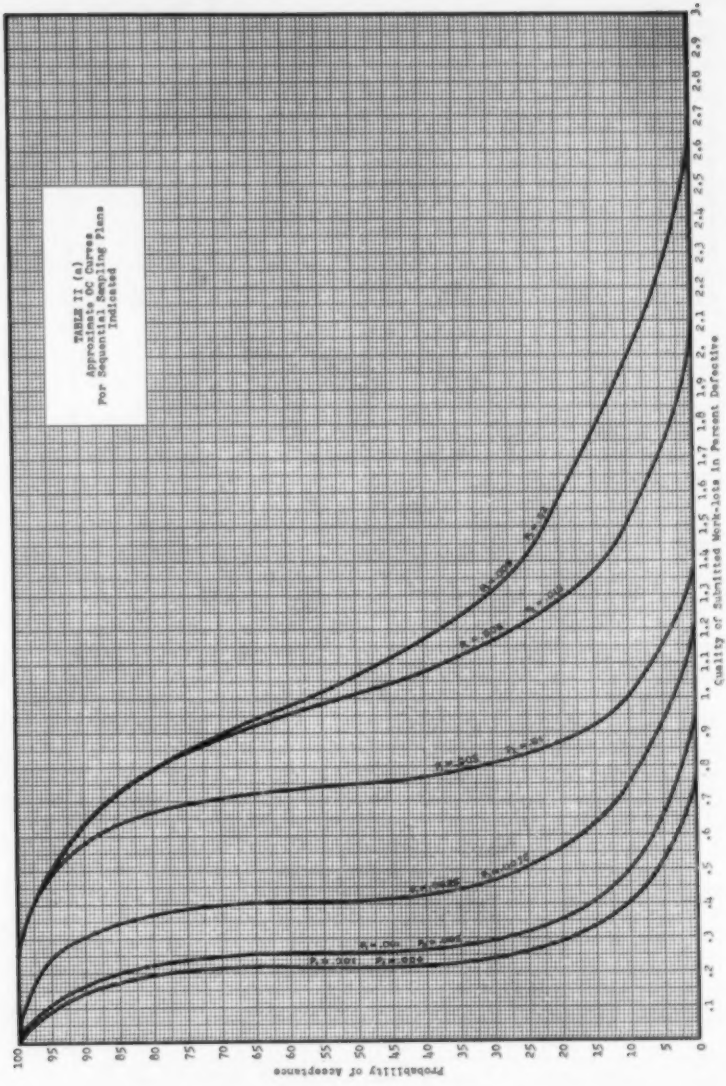
$p_1$ = the proportion of defectives allowable in an acceptable work-lot.

$p_2$ = the proportion of defectives which cannot be tolerated in a work-lot.

$\alpha$ = the maximum risk of rejecting a work-lot when $p_1$ is a fact.

$\beta$ = the maximum risk of accepting a work-lot when $p_2$ is a fact.

Description and outline for use of this chart found on pages 17 and 18.




Description for use of this graph found on pages 17 and 18.

| Dollar Value | No. of Occurrences In Work-Lot | Percentage of Total | No. of Occurrences In Random sample | Percentage of Random Sample |
|---|---|---|---|---|
| $ 00.00 to $ 5.00 | 156 | 8.9% | 10 | 6.7% |
| $ 5.01 to $ 10.00 | 87 | 5 | 6 | 4 |
| $ 10.01 to $ 25.00 | 332 | 19 | 28 | 18.7 |
| $ 25.01 to $ 50.00 | 313 | 18 | 31 | 20.6 |
| $ 50.01 to $ 75.00 | 149 | 8.5 | 10 | 6.7 |
| $ 75.01 to $ 100.00 | 78 | 4.5 | 9 | 6 |
| $ 100.01 to $ 200.00 | 136 | 7.8 | 17 | 11.3 |
| $ 200.01 to $ 300.00 | 134 | 7.7 | 10 | 6.7 |
| $ 300.01 to $ 400.00 | 200 | 11.4 | 19 | 12.6 |
| $ 400.01 to $ 500.00 | 93 | 5.3 | 10 | 6.7 |
| $ 500.01 to $ 600.00 | 40 | 2.2 | | |
| $ 700.01 to $ 800.00 | 28 | 1.6 | | |
| $2700.00 to $2800.00 | 1 | .1 | | |
| Total | 1,747 | 100.% | 150 | 100.% |

Fig.3. Comparison of distribution by dollar value of 1747 invoices with sample of 150 drawn at random.

Observed Error -- Ten Samples

| Sample Number | Observations Within The Sample 1. | 2. | 3. | 4. | 5. | $\bar{X}$ Average | R Range |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | $ 0 | $ 0 |
| 2 | | | | | | 0 | 0 |
| 3 | | | -$6.00 | | | 1.20 | 6.00 |
| 4 | +$1.86 | | | | | .37 | 1.86 |
| 5 | | | | | | 0 | 0 |
| 6 | | +$3.00 | | | | .60 | 3.00 |
| 7 | | | | | | 0 | 0 |
| 8 | | | | | | 0 | 0 |
| 9 | +$1.22 | | | | +$4.64 | 1.17 | 4.64 |
| 10 | | | | | | 0 | 0 |
| Total | | | | | | $ 3.34 | $ 15.50 |

Computation of 3 sigma control limits:

$\bar{\bar{X}}$ = $ 3.34/10 = $ .334
$\bar{R}$ = $15.50/10 = $1.55

Control Limits for $\bar{X}$:

| | |
|---|---|
| $\bar{\bar{X}}$ | .334 |
| $\bar{R}$ | 1.55 |
| Factor $A_2$ | .58 |
| UCL = .334 + (.58 x 1.55) | 1.23 |
| LCL = .334 - (.58 x 1.55) | - .56 |

Control Limits for $\bar{R}$:

| | |
|---|---|
| $\bar{R}$ | 1.55 |
| Factor $D_4$ | 2.11 |
| UCL = 2. 11 x 1.55 | 3.27 |

Fig. 4. Observed error in ten samples of five items each and calculation of Upper and Lower Control Limits for $\bar{X}$ and $\bar{R}$

Description for Figures 3 and 4 found on pages 18 and 19.

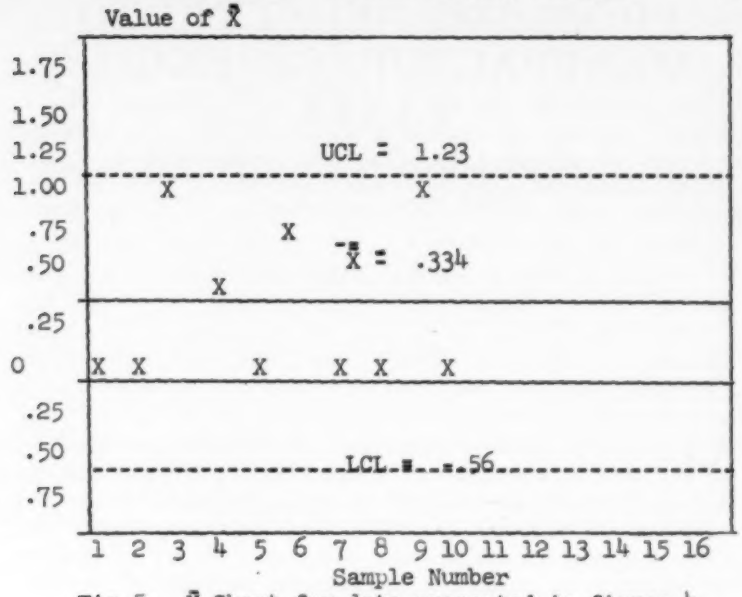



Fig 5. $\bar{X}$ Chart for data presented in figure 4.

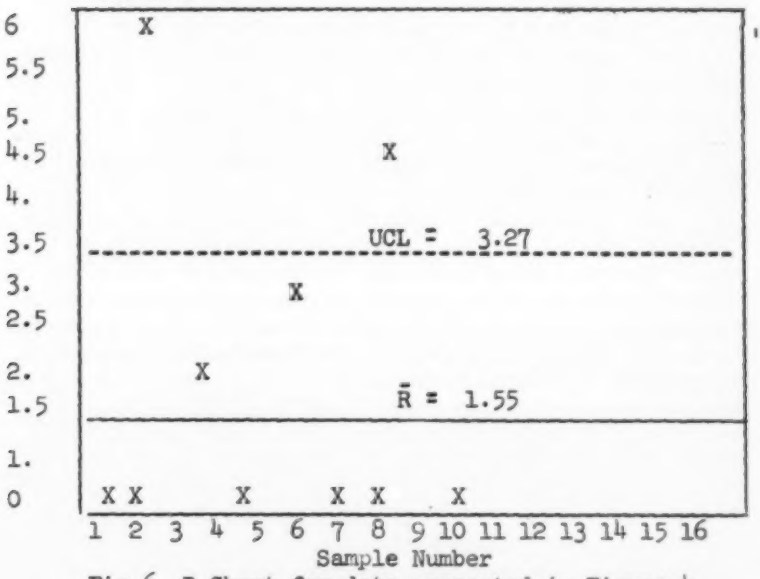



Fig 6. R Chart for data presented in Figure 4.

# PROBLEMS RELATING TO MANUFACTURERS' EXCISE TAXES

By CHARLES H. FRIEDRICH

Arthur Young and Company

*The auditor's ability to save his company money is perhaps one of the most impressive revelations of his usefulness. A fertile field for such pursuits lies in manufacturers' excise taxes. The author leads us through this interesting field, insofar as it applies to the United States, and examines some opportunities which many of us may perhaps have overlooked.*

MANUFACTURERS' excise taxes are imposed by Subtitle D, Chapter 32, of the Internal Revenue Code of 1954 which comprises sections 4061 to 4226. These taxes do not apply to all products manufactured in the United States but are limited to the specific articles enumerated in the statute. They may be based on weight (tires and tubes), volume (gasoline and lubricating oils) or sales price (automobiles, household and entertainment equipment, etc.).

Until comparatively recently business men and their advisors have evidenced little interest in technical problems relating to excise taxes. This lack of interest has probably been due to the apparent simplicity of taxes measured by either physical volume or selling price. Deductions to arrive at the net tax base, the source of most income tax controversies, are very limited in scope. In addition, excise taxes are generally regarded as a cost to be passed on to the consumer and refunds must generally be returned to the customer. A recent Court of Claims decision (General Motors Corporation (Frigidaire Division), 121 F. Supp. 932) emphasized that certain manufacturers' excise tax refunds are not required to be refunded to the purchaser. The rash of refund claims, many for substantial amounts, which resulted from this case has stimulated a new interest in these taxes. In addition, manufacturers are coming to realize that excise taxes are an element of cost, a reduction of which can give a manufacturer an advantage over his competitors.

The most common problems which arise in connection with manufacturers' excise taxes relate to questions of who is a manufacturer, how is the selling price (tax base) determined and what transactions are exempt.

## DEFINITION OF A MANUFACTURER

### *General Definition*

The Regulations (Reg. 46, Sec. 316.4) define a manufacturer generally as one who produces a taxable article from new or raw material (including scrap, salvage or junk) (1) by processing or changing the form of the material or (2) by combining or assembling two or more articles. Whether or not an assembler is a manufacturer depends on whether he produces an article where there was none before. For example, a retail truck dealer who buys chassis from one manufacturer, bodies from another and combines the two is a manufacturer. He produced a complete truck where there was none before. However, an automobile dealer who buys complete automobiles and exchanges the bodies before sale is not a manufacturer. He has not produced a new article.

Where an article is sold as a kit or in unassembled condition, the person who sells the kit, not the person who assembles it for his own use, is the manufacturer. Thus, if a distributor sells a package containing all or substantially all the parts necessary to produce a complete radio receiving set, the distributor is regarded as the manufacturer of the radio.

### *Further Manufacture*

A concern that purchases taxable articles and uses them to produce other taxable articles is considered to be a manufacturer. For example, if a manufacturer of radio-phonograph combinations purchases a phonograph mechanism (a taxable article in itself) and installs it in one of his combinations, he is a further manufacturer and liable for excise tax on the full sales price of the completed unit. However, he is taxed, in effect, only on the value which he adds to the taxable article. If he bought the component tax-paid, he is entitled to a credit against his own tax for the tax paid on the component. Alternatively, he may buy the component tax-free by furnishing the manufacturer of the component with an exemption certificate. However, inner tubes or automobile radio or television sets may not be purchased tax-free for use as material for further manufacture.

Further manufacture includes operations which do not improve the functional qualities of a product as well as those which add to the functional properties. If a manufacturer purchases an electric light bulb and colors it yellow so that it repels insects, that is a further manufacture which improves the functional properties of the article. If he purchases an unbranded bulb and puts his own brand on it, that is further manufacture which does not improve the functional qualities. In both cases, the further manufacturer is liable for manufacturers' excise tax on the article, with a credit for any tax which he paid to the original manufacturer.

*Importer as Manufacturer*

A person who imports a taxable article for sale or business use is liable for manufacturers' excise tax on the article. An importer is the person who holds title at the time the article is brought into the United States. Place of passage of title is determined by the intent of the parties, and the rules of the Uniform Sales Act are applicable.

If an individual incidentally imports taxable articles for his personal use, manufacturers' excise tax is not imposed. Thus, if an automobile dealer imports a European sports car and sells it to a United States customer, a manufacturers' excise tax is imposed. However, if the customer arranges to take title at the European port of shipment, the customer is an incidental importer for personal use, and no manufacturers' excise tax is due.

*Sales by Other Than Manufacturer*

If a taxable article is transferred from the manufacturer in a transaction to which no tax attaches, the subsequent sale by the transferee is subject to tax. If a manufacturer dies, the heirs, executors, administrators or other legal representatives are liable for the tax when the articles are sold.

A receiver or trustee in bankruptcy who conducts or liquidates a business under a court order, is liable for tax on all taxable articles sold by him, regardless of whether the articles were manufactured or imported before or after he took charge of the business. An assignee for the benefit of creditors is liable for tax on all taxable articles sold by him as assignee.

If one or more members of a partnership withdraw and the business is continued by the remaining partners or if new partners are admitted, the new partnership will be liable for tax on sale of taxable articles regardless of when imported or manufactured. A corporation which results from a consolidation, or a stockholder who acquires taxable articles upon liquidation of a corporation, is liable for tax on all taxable articles sold. An obligee who receives taxable articles as collateral, is liable for tax if he sells the collateral.

Where taxable articles are shipped on consignment, the manufacturer is liable for excise tax when the articles are sold by the consignee. However, use of the consignment method does defer the time for payment of the tax until sale by the consignee.

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*Divided Manufacturing Responsibilities and Rights*

Regulations 46 (Sec. 316.4) state that under certain circumstances where a person manufactures or produces a taxable article for a person who furnishes material and retains title thereto, the person for whom the taxable article is manufactured or produced, and not the person who actually manufactures or produces it, will be considered the manufacturer. Where a person, who has an exclusive license to record and sell a piece of music and owns the master recording, has records pressed by another person, who also furnishes the record compound, the licensee and not the presser is considered the manufacturer of the records. The owner of a patent on automobile sun visors has been held to be the manufacturer although the visors were manufactured for it by another company on a unit price basis.

The determination of whether the person who orders the work done is the manufacturer depends on the exact nature of the arrangement. For example, it was held that a contract between a taxicab sales company and an automobile manufacturer for the manufacture of taxicabs to the customer's specifications was for purchase and sale and not for labor and materials. Thus, the taxicab sales company was not the manufacturer.

Generally speaking, if a person retains ownership of the material or components, he is considered the manufacturer even though the article is fabricated with the labor and machinery of another. Also if a person retains control of the production and distribution of the article, he is considered the manufacturer even though another supplies the material or components and fabricates the article.

*Rebuilding as Manufacturing*

A rebuilder or reassembler of used parts is considered to be a manufacturer for manufacturers' excise tax purposes where he carries the unit in stock for later sale or exchange. No tax liability is incurred in the mere disassembling, cleaning and reassembling (with replacement of worn parts with tax paid parts). If taxable parts are produced or purchased tax-free, tax is incurred when they are used by the reconditioner.

A distinction is drawn between a person in the business of rebuilding and a mere repairman. If a person merely disassembles, cleans and reassembles (including replacing and reworking of worn parts) unserviceable units taken in exchange from customers and then puts the unit on his shelf for use as a replacement for the next customer's unserviceable unit, he is a repairman and no tax is incurred. On the other hand, if the person performs the same operations as the repairman but then places the unit in stock for sale to customers, he is a rebuilder and the rebuilt unit is subject to tax.

Under present law (Sec. 4062(b) I.R.C. 1954) the tax base for rebuilt automobile parts includes only the cash received; it does not include the value of the like part taken in exchange.

## DETERMINATION OF SELLING PRICE

### *General Rule*

In general the tax base is the manufacturer's actual selling price at the point of distribution or sale. However, where the company employs a selling subsidiary or a manufacturing subsidiary, a series of court cases has held that the tax base is the price at which sales were made by the sales company. Also there are specific rules as to certain charges which are to be included in or excluded from the tax base.

### *Specific Inclusions and Exclusions*

The law (Sec. 4216 I.R.C. 1954) provides that the tax base shall include "any charge for coverings and containers of whatever nature, and any charge incident to placing the article in condition packed and ready for shipment." Sometimes questions arise as to whether a particular charge is a packing charge or a sale of a taxable and a nontaxable article as a unit. In the latter case, the Revenue Service holds that only the portion of the sales prices allocable to the taxable article is subject to tax. For example, if a phonograph record is sold in the usual paper envelope, the cost of the envelope is a packing charge and the whole sales price is subject to tax. However, if a record is inserted in an elaborate booklet of several pages which describes the historical background and setting of the recorded composition, it is at least arguable that a nontaxable article (a book) and a taxable article (a record) have been sold as a unit.

If there is an agreement that the manufacturer will refund to the purchaser a specified amount upon return of a container, tax is nevertheless payable on the entire sales price. However, the manufacturer may claim a credit on his excise tax return for the month in which the refund is made for the portion of the tax paid on the amount refunded.

Depending on their nature, transportation charges may be required to be included in the tax base. If incurred for the benefit of the manufacturer they are required to be included. If incurred for the benefit of the customer, they may be excluded. Thus, the cost of transportation from factory to manufacturer's warehouse must be included in the tax base. If a manufacturer with several warehouses ships from a surplus stock to a depleted stock, this transportation is for the benefit of the manufacturer and must be included in the tax base. If a manufacturer receives an order for which there is insufficient stock in the local warehouse and ships part of the order from the warehouse

and part from a distant factory, all transportation charges, including those from the distant factory, may be excluded.

The rules relating to transportation also apply to such charges as insurance, handling and installation. If a manufacturer insures the article while it is in storage, that is for his benefit and the expense may not be excluded from the tax base. If the manufacturer insures it after it has been sold and while in transit to the customer, that is for the benefit of the customer and hence excludible.

The Revenue Service has adopted the attitude, supported by the courts, that a warranty charge with respect to which the customer has no option must be included in the excise tax base. However, the courts (General Motors supra) have gone on to say that the manufacturer may claim a credit in his return for the month in which he makes expenditures under the warranty for the tax attributable to the warranty expenditure. If the purchase of a warranty is optional with the purchaser and he pays a separate fee for it, transaction is a sale of a taxable article and a nontaxable article (the warranty policy) and the latter charge is not subject to tax.

Royalty payments and import duties are specifically included in the base for manufacturers' excise tax. Charges for amortization of the cost of tools and dies may be excluded from the selling price if title thereto passes to the customer by written agreement. If title remains in the manufacturer, such charges must be included in the sales price.

Trade discounts are generally granted unconditionally by the seller at the time of sale by reason of purchase in wholesale lots or some similar reason. Such discounts may be properly deducted from the list price to compute the tax base. In the case of cash discounts it is not usually known at the time of sale whether the customer will avail himself of the discount offer. Therefore, the excise tax must be computed on the gross selling price at the time of sale but a refund or credit may be claimed at the time the cash discount is allowed to the customer. Volume discounts and price protection agreement refunds are to be handled in the same manner as cash discounts.

Manufacturers' advertising and selling expenses may not be deducted from the excise tax base. Where a cooperative advertising fund is set up from contributions by the customer and the manufacturer, the customer's contribution may be excluded from the tax base if it is billed separately or listed separately on the invoice and if any unexpended funds are returnable to the customer. If it is not billed separately or is not returnable to the customer, it must be included in the tax base. If the customer makes expenditures for local advertising which is at least in part for his (the customer's) benefit and is reimbursed by the manufacturer, the manufacturer, at the time

of reimbursement, is entitled to a refund or credit of the tax on the amount reimbursed to the customer to the extent tax was paid thereon in the first instance. If the customer's share was excluded from the tax base, the manufacturer may claim credit for only his own share of the later payment. If the customer's share is included in the tax base, the manufacturer may claim credit on the total amount of the subsequent payment. If the customer inserts advertising in a local newspaper and the advertisement bears only the name of the manufacturer, no refund or credit is allowed to the manufacturer when he reimburses the customer for this type of advertising.

## EXEMPTIONS

### *Classification of Exemptions*

There are four types of exemptions from manufacturer's excise tax. These are all statutory and reference should be made to the statute for the details of each exemption. They are as follows:

1. Exemptions based on nature of article.
2. Exemptions based on place of delivery.
3. Exemptions based on nature of seller or buyer.
4. Exemptions based on buyer's use.

### *Exemptions Based on Nature of Article*

These are specific statutory exemptions and therefore the applicable section number of the 1954 Internal Revenue Code has been inserted after each item. The exemptions are as follows:

1. House trailers or tractors (Sec. 4063).
2. Certain sized tires and tires with internal wire fastening (Sec. 4073).
3. Sporting goods measuring in length less than the dimensions specified (Sec. 4161) i.e., essentially children's toy sporting goods.
4. Professional and commercial type X-ray still and motion picture cameras and films (Sec. 4173).
5. Certain machine guns and short-barrelled fire arms (Sec. 4182).
6. Retail sale type cash registers (Sec. 4192).
7. Articles subject to retailers' excise tax on jewelry (Sec. 4221).
8. Radios, television sets, phonographs, automobile radio or television sets, and combinations thereof which are of a non-entertainment type.

### *Exemptions Based on Place of Delivery*

Articles for export or shipment to a territorial possession of the United States which are, in due course, so exported or shipped, are exempt from manufacturers' excise tax. In order to qualify for this exemption the goods

must actually be exported. If the goods are stolen or destroyed en route to the port of embarkation, they will not be exempt. Even if destroyed in the territorial waters of the U. S. while the ship is under way, the exemption will not apply. However, if they are destroyed on the high seas prior to arrival at the foreign port, they will probably still qualify for exemption. In order to qualify for the exemption the manufacturer must obtain proof of exportation such as a copy of export carrier's bill of lading, landing certificate of foreign customs officer, etc.

*Exemptions Based on Nature of Seller or Buyer*

Generally, this type of exemption relates to sales to the U. S. Government, States and political subdivisions and representatives of foreign governments. The specific exemptions are as follows:

1. Articles of native Indian handicraft manufactured or produced by Indians on Indian reservations, in Indian schools, or under jurisdiction of U. S. Government in Alaska (Sec. 4223).
2. Firearms, pistols, revolvers, shells and cartridges purchased with funds appropriated for military department (Sec. 4182).
3. General exemption for U. S. and possessions as to articles purchased for their exclusive use if imposition of tax will cause substantial burden or expense that can be avoided by granting the tax exemption, and if full benefit of exemption will accrue to U. S. (Sec. 4293).
4. Musical instruments sold or resold for use of religious or non-profit educational institutions for exclusively religious or educational purposes (Secs. 4152 and 6416).
5. Articles sold or resold for exclusive use of State, Territory of U. S., or political subdivision thereof, or District of Columbia (Secs. 4224 and 6416).
6. Articles sold to ambassadors, ministers, other diplomatic representatives of foreign governments (other than consular officers), and members of their families and households (Rev. Rul. 296, 1953-2 Cum. Bull. 325).

The last item above applies to all Federal excise taxes including admissions, cabaret, dues taxes, etc.

*Exemptions Based on Buyer's Use*

Sales to other manufacturers for their use in manufacturing a taxable article or for use as a component of a taxable article are exempt if the vendee gives the vendor an exemption certificate certifying that he will use the article for further manufacture. Similar treatment is accorded to a middleman who will in turn sell to a further manufacturer. This exemption is not applicable to tires, inner tubes, automobile radio and television sets.

Articles sold or resold for use as fuel supplies, ships' stores, sea stores or equipment on U. S. or foreign warships and military aircraft are exempt. Also exempt are such articles sold for use on ships in fishing and whaling business and the shipping business in foreign trade, between Atlantic and Pacific ports in the U. S. and between the U. S. and its possessions. Civil aircraft in foreign trade or trade between the U. S. and its possessions are included but foreign registered civil aircraft are included only if the country of registry grants reciprocal privileges to U. S. civil aircraft.

Public Law 367, effective September 1, 1955, exempted the following from manufacturers' excise tax: automobile parts and accessories (other than tires, inner tubes and automobile radio and television sets), refrigerator components, radio and television components and camera lenses which are sold to a purchaser for use in the manufacture of any article, whether or not such article is taxable. Also exempt are sales of these items to a middleman who will sell to a manufacturer of any article, taxable or not.

## REFUNDS AND CREDITS

The law and regulations contain procedures for claiming credits or refunds of overpayments of manufacturers' excise taxes, arising through error, purchase of tax-paid raw materials, discounts, allowances, etc. Since the rules governing these procedures are quite complex, questions relating to credits or refunds should be referred to the Company's tax experts.

# EVALUATION OF INTERNAL CONTROL*

By E. D. McMILLAN

Partner, United Kingdom firm of Price Waterhouse & Company

*The evaluation of internal control is a vital process in any type of audit—external or internal. This article covers the requirements of this evaluation from the standpoint of the English public accountant. Our readers will undoubtedly be interested in the writer's viewpoint, particularly as to some of the comparisons and observations that are made relating to United States practices.*

THE evaluation of internal control is a task which has to be performed both by internal auditors and by accountants in public practice whether in their capacity as auditors or as advisers on accounting organization and methods.

I propose to deal with the subject primarily from the standpoint of independent auditors in the hope that this will be of interest to you as internal auditors, not only because you have a similar job to do but because in performing this part of an audit there is considerable scope for mutual assistance between internal and independent auditors.

Moreover, as accountants in practice are experiencing an increasing demand from their clients for advice on management accounting, I should also like to touch briefly on the evaluation of internal control for that purpose.

## DEFINITION OF INTERNAL CONTROL

I have been unable to trace references to internal control in any of the standard auditing textbooks used in this country. There are, of course, frequent references to internal check, but the term 'internal control' is commonly used to indicate something broader in scope. 'Internal control' has been defined in notes issued by the Council of the English Institute as

> 'the whole system of controls, financial and otherwise, established by the management in the conduct of a business including internal check, internal audit and other forms of control.'

A committee of the American Institute of Accountants has defined internal control as comprising

*Delivered at a meeting of the London Chapter of THE INSTITUTE OF INTERNAL AUDITORS. Reprinted from The Accountant, April 7, 1956.

> 'the plan of organization and all of the co-ordinate methods and measures adopted within a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency and encourage adherence to prescribed managerial policies.'

The definition of internal check in the English Institute's notes is

> 'the checks on the day-to-day transactions which operate continuously as part of the routine system, whereby the work of one person is proved independently or is complementary to the work of another, the object being the prevention or early detection of errors and fraud.'

As the definitions of internal control which I have quoted suggest things beyond the scope of accountancy, I should like to restrict my contribution to our discussion to the evaluation of accounting control, although I am well aware that both independent and internal auditors are often required to deal with wider problems of control. Even within this restricted meaning, internal control means something broader than internal check and is designed to ensure that accounts prepared for the management or proprietors are reliable and informative; also that, subject to the limitations of accountancy, the concern's property is safeguarded against unnecessary loss. It is therefore concerned with errors of accounting principle as well as arithmetical discrepancies and with loss of all types of assets, not only of cash or the equivalent.

Although the term 'internal control' is generally accepted and understood, it seems to me that the use of the word 'internal' is unfortunate, since it implies that there is such a thing as external control in day-to-day operations whereas, obviously, any effective day-to-day control, whether by the proprietors or the management, must be from inside the organization.

I have been told that two or three years ago you discussed a paper on the relationship between the internal and statutory auditors; to avoid encroaching on this subject, I should therefore like to refrain from dealing with the evaluation by the statutory or independent auditors of that part of internal control which is in the form of an internal audit.

## AUDITING TECHNIQUE AND THE DEVELOPMENT OF INTERNAL CONTROL

An effective system of internal control which ensures the presentation of reliable accounting information will obviously accomplish what might well be regarded as the duty of the independent auditor. Is the auditor who satis-

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fies himself that the system is effective therefore relieved of some of his responsibilities? Obviously the auditor must examine all material items in the accounts in some detail, but in order to consider his responsibility in connection with routine transactions it is necessary to review the historical development of auditing technique and to consider how it has been affected by the parallel development of internal control. It has been recognized for more than half a century that it would be quite uneconomic for the auditors of a large organization to check and vouch every transaction which has taken place during the period of the accounts. To go back no further than 1895 there was evidence of this in the *London and General Bank* case in which the following statement about the duty of an auditor was made by the judge:

> 'Where there is nothing to excite suspicion, very little inquiry will be reasonable and quite sufficient; and, in practice, I believe business men select a few cases haphazard, see that they are right and assume that others like them are correct also.'

The auditing textbooks written during the first quarter of the present century give the impression that although the learned judge referred to 'a few cases' it was generally felt in the profession that in order to perform his duty an auditor must vouch and check a material proportion of transactions. Such tests were designed more to discover errors or discrepancies than to find out the procedures employed, although, of course, attention was paid to evidence of procedures such as the initials of the persons responsible for checking or authorizing a voucher.

The proportion of transactions tested varied according to circumstances and to the auditor's assessment of the value of internal check, but in the majority of cases the auditor must have commenced his task with the knowledge that there were probably arithmetical errors in the bookkeeping and transactions unsupported by vouchers. His tests would therefor be designed to ascertain the extent of these discrepancies and he might even decide, for instance, to check a substantial proportion of the personal ledger postings.

Internal control in industrial concerns, as we know it today, is something which has grown up in comparatively recent years, largely to cope with the problem of managing concerns which, owing to amalgamations and general economic progress, have greatly increased in size. This development has taken place both in this country and in the United States and a statement on auditing standards approved by the American Institute in 1948, laid down that

> 'there is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.'

On the same subject, a committee on auditing procedure of the American Institute stated in 1951

> 'The ordinary examination incident to the issuance of an opinion respecting financial statements is not designed and cannot be relied upon to disclose defalcations and other similar irregularities, although their discovery frequently results. In a well-organized concern, reliance for the detection of such irregularities is placed principally upon the maintenance of an adequate system of accounting records with appropriate internal control.'

## DUTY OF THE AUDITOR

These statements indicate that in the U.S.A., as in this country, the evaluation of internal control is now regarded as an important part of the duty of an auditor and suggest that the auditor, having satisfied himself that the internal control over a particular class of transaction is satisfactory, need not carry out any further detailed checking of transactions in that class. The statements also suggest that the purpose of evaluation is more to ascertain the extent to which the system ensures the reliability of the accounts than whether it provides safeguards against relatively minor defalcations (although, of course, a good system would perform both these functions).

In comparing the duties of auditors in the United States and in this country it must be borne in mind that the liability of an American auditor depends primarily on his contract with his client, whereas normally the duties of an auditor of a company in the United Kingdom are to make the examination and present the report required by the Companies Act or arise from the duties so laid down. For this and other reasons there may be differences in the scope of the detailed examination of similar concerns, but in both countries the nature and extent of the examination are determined largely by the result of an evaluation of internal control and in carrying out the examination itself the auditor pays particular attention to the procedures employed by the staff of the concern in dealing with the transactions.

The use of good systems of internal control is by no means confined to the larger concerns; even in a small business one frequently finds that close personal supervision exercised by a director, partner or proprietor makes a strong contribution to a good system. To deal with the other extreme, there are many cases where the auditor feels it to be his duty, in the absence of sufficient control, to carry out what is almost a completely detailed audit. This may apply not only to relatively small concerns, but to those dealing with large sums of money but employing only a small accounting staff, e.g. a large investment trust.

## PURPOSE OF EVALUATION

The purpose of the evaluation of internal control by an independent auditor in this country is, therefore, to enable him to form an opinion as to the extent of the examination he must make in order to report on the accounts and for that purpose to do what is reasonable towards satisfying himself that there are no undisclosed irregularities of such importance as to invalidate the general fairness of the view presented by the accounts.

An auditor has the duty under the Ninth Schedule of the Companies Act, 1948, of reporting whether proper books of account have been kept by the company, and Section 147, although it does not give a direct definition of 'proper books of account,' makes it legally necessary for a company to keep

> 'such books as are necessary to give a true and fair view of the state of the company's affairs and to explain its transactions.'

Nevertheless, a clear report by an auditor does not necessarily signify that he is completely satisfied with every detail of the system of internal control. For his own primary purpose he carries out sufficient examination to cover, so far as they concern that purpose, matters over which he finds the internal control to be defective. He normally regards his responsibilities as fully met if he brings the defects to the attention of senior officials or of the directors in order that appropriate action may be taken by them to put matters right. Where the deficiency in internal control is of such a nature that in spite of his own examination the auditor feels that the accounts may be materially inaccurate he would, of course, refer to the matter in his report to the members.

## ESSENTIAL FEATURES OF INTERNAL CONTROL SYSTEM

In order to be able to evaluate internal control, one must obviously have a clear idea of what one expects to find in a good system. According to a special report by the committee on auditing procedure of the American Institute in 1949, the characteristics of a satisfactory system of internal control would include the following:

> A plan of organization which provides appropriate segregation of functional responsibilities.
>
> A system of authorization and recording procedures adequate to provide reasonable accounting control over assets, liabilities, revenues and expenses.
>
> Sound practices to be followed in performance of duties and functions of each of the organization departments.
>
> A degree of quality of personnel commensurate with responsibilities.

Generally speaking, I think that these characteristics are equally applicable to this country as to the United States, but there are certain differences in conditions in the two countries which, although they would not invalidate the principles laid down, may give rise to differences in the way they are applied in detail. I propose to deal with each of the characteristics in turn indicating some differences of this sort.

## SEGREGATION OF RESPONSIBILITIES

The first requirement, *i.e.* the segregation of functional responsibilities, calls for organizational independence between the departments responsible for operation, custody of assets and accounting. The theory is that in order to ensure that the proprietors or management are presented with true and unbiased accounts showing how property has been dealt with by those intrusted with its custody, no department should be completely responsible for recording its own operations. The segregation of duties, however, is not in itself sufficient; there must also be provision for reasonably frequent checks on the actual existence and condition of the property. These checks should preferably be made by a person who is not responsible either for the custody or accounting, although in some cases a dual check by two or more persons so responsible may be satisfactory. Physical checks of the more durable assets like plant and machinery should be regarded as equal in importance to physical checks of current assets like stock, but owing to the relative infrequency of transactions it is not usually regarded as necessary to carry them out so often.

In the United States it is usual for the custody of cash and securities to be segregated completely from accountancy and to be made the responsibility of an official usually known as the treasurer who, like the chief accountant or controller, is one of the executives immediately responsible to the top management or board of directors. In this country, although it has long been recognized that the cashier should not be responsible for any accounting records other than those recording day-to-day cash transactions, it is unusual, except in some of the largest concerns, to find in company organizations an official corresponding to the treasurer; it is usual, however, for the directors to exercise considerable control over the more important transactions in cash and securities by requiring, for instance, checks over a certain amount to bear the signature of one or more directors. The secretary also exercises some control over such transactions and where his office is not combined with that of chief accountant he probably fulfils some of the functions of the treasurer in American companies.

## CONTROL OVER STOCK AND FIXED ASSETS

Apart from the exception I have mentioned, I think it can be said that the principle of the segregation of accountancy from custodianship and from

operation is accepted in this country as it is in the United States; in fact, this is almost essential if double-entry bookkeeping is used. It is by no means universal, however, to find that the accounting records provide the means for periodical checks on the physical existence of assets or that these checks are, in fact, carried out.

There are probably many concerns, for instance, which do not maintain inventory or stock accounts and still rely entirely on an annual stock-taking to ascertain the quantity and value of their stock. One usually finds that the reason why a concern does not maintain proper book records of the value of stocks is either that it is unable to produce reliable costing information or that its costing system is not properly integrated with the other accounting records.

In such circumstances it seems to me that the auditors must regard the internal control as defective, not only because there may be material errors in the amount of stock stated in the accounts but also because of the absence of a valuable check on possible defalcations or other losses. They must, therefore, take whatever steps they think necessary to satisfy themselves; in most cases this involves a great deal of detail work on the stock sheets and on transactions during the period which might otherwise be regarded as unnecessary.

Similarly, there are concerns which do not maintain detailed registers of their fixed assets such as plant and machinery. In such cases the auditor will have to give special attention to the method used to ensure that retirements are properly dealt with, but whether or not he need take a serious view of the matter will depend upon the circumstances, including the value and nature of the assets and the degree of physical control which can be exercised over them by the management.

## ACCOUNTING MANUAL

The second requirement of a satisfactory system of internal control which I mentioned was an adequate system of procedures. In America this seems in all large companies to imply a written plan or manual which is, in effect, the book of rules of the accounting organization. In this country it is not uncommon, even in concerns where a good system is in operation, to find that there is no accounting manual in existence. One of the matters to which the auditor therefore applies himself is an inquiry into the nature and effectiveness of the system in use. Although the absence of a manual may make such an inquiry laborious, it is difficult to visualize circumstances in which the auditor, although satisfied with the system, would apply great pressure on the management to get it committed to writing. Most auditors, I think, would judge the system on its own merits and not regard it as deficient merely because it is not embodied in a manual.

## DIVISION OF DUTIES AND PERSONNEL

The third requirement of sound practices in the performance of duties and functions involves a division of duties so that no one person will handle a transaction from beginning to end. This is the sort of thing that is covered by the term 'internal check'; the measures employed are stated in most textbooks on auditing and ought to be used in most businesses.

Some of the precautions taken against fraud in American concerns, however, are not usually regarded as necessary here. For instance, in the United States an outside company operating an armoured-car service is frequently employed to pay wages; although this system has the advantage of giving protection against robbery, few British concerns would feel it necessary to call in an outsider to take part in the payment of wages and protect them against fraud by their own employees. American systems are also frequently rather strict in requiring checks to be mailed to the payees by departments other than those responsible for requiring or drawing the checks. Although it may be desirable to do this where it fits reasonably well into the office routine, I am not sure that we would always regard this as essential in the United Kingdom where the crossing of checks and general banking practice ensure that there is little danger of the proceeds being obtained by anyone other than the named payee. No doubt the more stringent methods of dealing with check payments which are usually found in American systems are required partly because of the comparative ease with which the person in possession of a check can obtain payment.

The general crossing of checks has no legal force in the United States and neither paying nor collecting bankers appear to take the same sort of precautions as bankers in this country to protect their customers against fraud by employees. Consequently, a person in possession of a check, even if he has difficulty in obtaining payment from the bank on which it is drawn, would have little difficulty in cashing it elsewhere in that country as there are check-cashing agencies which, for a small fee, will cash checks for anyone.

The fourth requirement of employing personnel of a quality commensurate with their responsibilities, suggests an ideal which is not always possible to achieve under conditions of full employment. It is, however, as far as I know, customary for British concerns to take up references in order to ensure that new employees are of proved integrity, and as a further precaution, employees who handle cash and other valuables are usually covered by fidelity insurance.

## AUDITOR'S METHOD OF EVALUATION

Having considered very briefly the essential features of a good system of internal control, I should now like to think about the technique to be em-

ployed by auditors in finding out the essential facts about the system, since this must be a preliminary to evaluation. It should be borne in mind that it is not always sufficient for an auditor merely to make inquiries and base his evaluation on what he is told; he should take whatever steps are reasonable to verify it.

The approach of independent auditors to this problem is frequently informal. At the first audit inquiries are made into the system and the necessary notes are made; then at subsequent audits it is left to the senior accountant in charge of the audit to draw the attention of his principal to shortcomings in the system so that any necessary changes in the audit program can be made or the matter can be taken up with the management, whichever is appropriate. To avoid the danger that under these conditions a proper review of internal control may be overlooked when questions which seem to be of greater importance arise in the course of the audit, it is sometimes felt that there is scope for the use of some form of *questionnaire* or check-list on internal control prepared, if practicable, in a form which can be used by the auditor on a number of his audits.

In some cases the *questionnaire* is combined with the audit program and sets out in appropriate sections firstly, the answers to questions designed to ascertain the safeguards which are in force and, secondly, the test-checks which have been carried out in order to verify that the answers are correct. In America, I understand that the *questionnaire* is sometimes handed to the chief accounting officer with a request that he will supply the answers, but I hardly think that this procedure can be popular with chief accountants. In any case, I think the answers should properly be obtained from the people who are responsible for the detail work and are probably in a better position than the chief accountant to know the procedures actually carried out.

## USE OF QUESTIONNAIRE IN PRACTICE

There can be little doubt that in the audit of a concern with a number of branches or subsidiaries performing similar functions the use of a standard check-list or *questionnaire* will have considerable advantages since it will ensure that a uniform standard is applied in evaluating internal control at all locations; it will also save time which would otherwise have to be spent in planning each examination. This would also apply to an auditor whose practice consists of clients who can be divided into groups broadly similar in function, organization and size; for instance, a firm might have one *questionnaire* for its manufacturing clients and one for its retailing clients.

Here in London, owing to the diverse nature and size of our clients' businesses and accounting systems, it would be difficult to frame a comprehensive and detailed *questionnaire* without including a large number of questions not applicable to any individual case; this would be tiresome as

well as a waste of time and paper. One has only to think of the different points which would have to be considered in evaluating the internal control of the following which might be regarded as typical clients of a London firm of accountants:

a clearing or merchant bank;

an investment trust or finance company;

a firm of stockbrokers, solicitors or architects;

a charity;

a departmental or chain store;

a manufacturing concern;

an insurance company;

a rubber, tea or mining company;

an import or export merchant house;

a wholesaling business.

Quite obviously those responsible for the audit of each of the concerns I have mentioned, if they are to use a *questionnaire* dealing with all necessary points of detail, would have to use one 'tailor-made' for the particular job. Whether to use a standard form of *questionnaire* is obviously a matter for each firm to decide on the facts of its own practice. In many cases the answer might be to issue standard instructions setting out the general line of inquiry into internal control supplemented by a specimen *questionnaire* as a model which would serve to illustrate the general principles and might, at the discretion of senior members of the staff, be wholly or partly used in appropriate cases.

## OBSERVATIONS AND TESTS

Whether or not a *questionnaire* is used, it is still necessary for the audit staff to carry out a proper review of internal control and besides asking questions they should make whatever observations and tests are reasonable to verify that the answers given are correct. Auditors sometimes feel, however, that in an audit where the system changes very little from year to year it is unnecessary to review the whole system in detail each year, and that it is more effective to deal with certain sections so that the whole system is covered over a period of, say, three years.

It is normal practice in the U.S.A. for the independent auditor to observe the stock-taking and this is normally done here and in other countries where a concern is a subsidiary of an American company. In appropriate cases such an observation might well be carried out as part of a review of internal control. It has for a long time been a not uncommon practice for independent auditors to attend the payment of wages. In appropriate cases

it might also be useful to them in their review of internal control to be present when mail is opened or when transactions with customers are taking place. With cooperation from the staff of the concern they can arrange to observe various routine tasks as they are carried out and thus obtain a better grasp of the system as it is operated in practice than they can obtain by checking completed transactions.

Whatever observation is carried out it should, however, be supplemented by tests of completed transactions. The proportion of such transactions which should be tested is always a matter for careful assessment by the auditor in the light of all the circumstances and I should be reluctant to mention any proportion as likely to be generally appropriate. It may be of interest to note that the American C.P.A. Handbook puts forward with reservations a suggestion that the amount of checking carried out in order to prove adequacy of internal control would probably be not less than 10 per cent nor more than 25 per cent of that required for a detailed audit; but (rightly in my view) it does not commit itself on how much is required for a detailed audit.

A recent publication of the American Institute entitled *A Case Study on the Extent of Audit Samples* gives programs formulated by eight different accountants to deal with this problem for a hypothetical concern. It shows that there were wide differences in the extent of the testing considered necessary. In this country a similar survey would undoubtedly also show wide variation and one is left to conclude that the proportion of transactions tested must, therefore, be a matter for individual judgment in each case; it should, however, be sufficient to ensure that the transactions tested represent a fair sample having regard to the period covered by the audit and the various types of transaction undertaken by the business.

## MANAGEMENT ACCOUNTING

I have attempted to deal with the evaluation of internal control mainly from the standpoint of an accountant acting as independent auditor, but, as I mentioned in my opening remarks, practising accountants are receiving, on an ever-increasing scale, requests from their clients for advice on management accounting.

Although the approach to this work is somewhat different from that of an auditor, the question of internal control is a most important consideration. The object of management accounts is to give all those concerned with the management of the business as much information as possible to assist them in making decisions and an efficient system must give not only information regarding the financial position of the concern and its past trading results, but also a variety of useful statistics and estimates which are required by

the various executives. As important decisions may be made on the basis of such information it must be produced quickly and accurately.

The professional adviser must make a careful and detailed examination of the requirements of the business to ascertain what information the management needs and to decide upon the methods which should be used for its production, bearing in mind the necessity for both speed and accuracy. He would no doubt consider whether the introduction of some form of mechanized accounting, including, perhaps, electronic accounting machines, would improve the efficiency of the system and would enable the information required to be available earlier than would otherwise be the case. He would also consider whether the internal control was adequate to ensure the accuracy of the information.

The internal control required for this purpose, however, usually goes beyond what an auditor would consider essential, as a proper system of management accounts usually embodies a number of inherent controls which may not be required in a system which is designed simply to record the financial transactions necessary for the production of the annual accounts. For instance, effective controls are provided by the budgets of sales, production, and so on, which are features of management accounts. Moreover, information which is derived from the accounting records is made available to technicians and others whose knowledge provides a further check on it.

## CONCLUSION

I have attempted to deal in a general way with the evaluation of internal control from the point of view of an accountant in practice, but I am well aware that the point of view of internal auditors may be very different. For one thing, the attitude of directors and management towards accountancy and internal control is liable to differ as between companies which employ internal auditors and those which do not. The very fact that a company has an internal audit staff at all seems to suggest that those responsible for management regard internal control as of importance. One usually finds that quite apart from its internal audit, such a company has a good system of internal control.

Unfortunately for accountants in practice, good systems of internal control are by no means universal, but the increasing demand for advice on management accounting which I have mentioned seems to suggest that there is a growing tendency amongst managements to regard modern accounting techniques as a valuable instrument. It is only when accounting control is used in this way that a great deal of unnecessary drudgery can be eliminated and the continuous overhaul of the system by internal auditors and its periodic overhaul by the independent auditors assume full importance.

# THE THURSTON AWARD

*Report of a committee appointed in June 1956 by the Planning Committee of* THE INSTITUTE OF INTERNAL AUDITORS *to review, clarify and amplify the terms and conditions of this award.*

THE Planning Committee of THE INSTITUTE OF INTERNAL AUDITORS decided that the readers of THE INTERNAL AUDITOR should have more specific information regarding the Thurston Award. In June 1956 it appointed a committee to review the subject. The committee was to recommend any necessary changes in criteria or methods of selection or administration, and to advise the readers of THE INTERNAL AUDITOR of its conclusions. By presenting these facts, it was hoped to stimulate a greater interest in competing for the award.

The report is now submitted. It deals with all aspects of the award and concludes with a summary of recommendations.

## OBJECTIVES OF THE AWARD

The Board of Directors of THE INSTITUTE established the award in March 1951 as a tribute to the memory of John B. Thurston, its first national president and an eminent authority in the field of internal auditing. The award is made annually to the author of that article published in THE INTERNAL AUDITOR which is voted to be the outstanding paper in the field of internal auditing.

The Board hoped, through this award, to benefit the membership of THE INSTITUTE, the profession and the publication by providing an added stimulus to submit papers and by recognizing outstanding contributions to the literature of the profession.

## PUBLICATION

The award was originally based on papers selected for publication in THE INTERNAL AUDITOR for each year ending June 30. As the prize is presented at THE INSTITUTE's annual conference, and because the conference dates were recently changed, it was decided in May 1955 to select the winning article from issues of THE INTERNAL AUDITOR ending March 31 each year.

Publication is a prerequisite for selection for the award. It is therefore of interest to explain the method of selecting articles for THE INTERNAL AUDITOR.

Members of the Editorial Committee review papers received by THE INSTITUTE's office. The criteria for selection are: usefulness and value to readers; quality of writing; presentation and clarity; technical soundness; and any additional factors which merit publication. Orthodoxy is not a criterion. Contentious material is often, in fact, most desirable as a stimulus for professional thought.

Papers selected for publication may not always be printed in the next issue going to press. By holding over articles for a later issue, it is often possible to create a better balance and to protect against over-specialization in any one issue.

The customary layout of the articles is to print them in two groups: 'technical articles' and 'Student's Department.'

The committee recommends that articles published in the Student's Department of the publication be given equal consideration to those published in its technical pages. Articles of outstanding quality are frequently published in this section because of their special interest and value to educators and students.

## SELECTION GROUP

The Board of Directors designated the Editorial Committee to select the paper for the award each year. In May 1955, the chairmen of the Educational Committee and Research Committee were invited to join the selection group.

## PERSONAL ELIGIBILITY

Three of the six award winners were INSTITUTE members or subscribers to the publication; the other three were not. The Committee considers this precedent as to eligibility desirable as a means of recognizing contributions of those who are not members of the profession.

The Committee further considers that only the following persons shall be ineligible for the award:

—members of the selecting group, as later described;

—the managing director, the president and the immediate past president of THE INSTITUTE.

## CRITERIA FOR SELECTION

The Board of Directors decided that there should be no set requirements as to subject, presentation or number of words. Selection should be based upon general consideration of the originality and value of the article as a contribution to the advancement of the philosophy, the practice and the literature of our profession.

The committee considers that more specific criteria should be defined in line with these broad principles. These should serve as a guide for writers who submit articles for publication. The criteria cover two areas: the value of the subject matter and the quality of its presentation.

With regard to subject matter, articles should deal directly or indirectly with internal auditing, and they should contribute to professional literature in advancing practical knowledge or theoretical concepts. Articles most likely to qualify will generally fall in the following categories:

(1) *Those Dealing with the Extension of Practical Applications*

The value of internal auditing as a profession depends largely on its contribution to the organizations it serves. Practical achievement above all things is the measure of its success. Articles in this area deal with the development of techniques which enhance the value of internal auditing as a tool of management. They may deal with the extension of auditing practice into fields which it does not traditionally cover; they may deal with procedures and practices which improve effective performance, create better results, or preserve quality while reducing audit costs.

(2) *Articles Which Propound or Develop Auditing Concepts*

Internal auditing is dynamic. As business and other enterprises develop, so must auditing broaden its scope and its horizons. Articles which introduce and instill new thinking, and which lead toward a broader understanding of existing thought, are of high value. They contribute both to the profession itself and to the thinking of educators who are training its future members.

(3) *Articles Dealing with the Strengthening of Audit Administration*

Underlying the execution of efficient auditing, there are many auxiliary devices which the auditor must use; staff selection and recruiting; staff management; training; programming; the development of manuals; human relations; ethics; to mention a few. The quality of professional performance can be bettered through a thorough understanding and use of these aids. Articles in this field are of practical value to the auditor.

While these areas are specified as offering opportunity for original and constructive articles, they are not presented as a means of limiting the field of endeavor. Rather they are expressed as a guide to future contributors.

Second to subject matter is the criterion of readability. The message conveyed by the article should have impact and hold the readers' attention. This calls for good organization of the material, clarity of expression, and effective style.

## SOURCES OF ARTICLES

The award was granted first in 1951 and has been made in each succeeding year. Of the six awards made to date, only one was made to an internal auditor who was in actual practice when the award was granted. Perhaps this has been caused by a natural modesty on the part of internal auditors; perhaps there is a lack of understanding as to the type of article which would qualify for the award. It is hoped that this report will help to clarify these doubts.

Officers of THE INSTITUTE's chapters should engage more energetically in urging and assisting their members and guest speakers to submit contributions for publication. Members have prepared much good material for informal discussions, panels and technical papers at chapter and regional meetings. If they suitably adapt the style of this material, recognizing that technical articles call for more formal treatment than oral presentations, they would add greatly to the quality and quantity of articles now received for publication. The assistance and leadership of chapter officers should provide a wealth of good contributions to the pages of THE INTERNAL AUDITOR.

## RECOGNITION

The Board of Directors decided that the award should take the form of a useful article of lasting value, rather than a plaque, cup or medal. The retiring president of THE INSTITUTE presents the award at the banquet of each annual conference. The prize winner is also recognized by the publication of his article in the booklet of technical papers delivered at that conference.

The committee considers that THE INSTITUTE should issue press releases to newspapers in the area where the winner lives and works. It considers also that, in recognition of the part played by chapter officers, there be recorded against the name of each chapter listed in the Year Book the dates of Thurston Awards won by its members.

## SUMMARY OF RECOMMENDATIONS

The principles and criteria established by the Board of Directors for the Thurston Award appear on page 9 of the June 1951 issue of THE INTERNAL AUDITOR. They are fully covered in this report, and the committee considers them fundamentally sound. However, in amplification, it makes the following recommendations:

1. Continue the practice, established in May 1955, of selecting the article from the quarterly publication ending March 31 of each year.
2. Select from articles published in the Student's Department in addition to those appearing in the technical section of the publication.

3. Continue the practice of considering all authors eligible for the award, excluding only the managing director, president and immediate past president of THE INSTITUTE, and the members of the selection group.
4. Continue as members of the selection group the chairmen of THE INSTITUTE's committees on education and research.
5. In selecting the winning article, give special consideration to the criteria outlined in this report.
6. Stimulate, through chapter leadership and assistance, the submission of more articles from THE INSTITUTE membership and guest speakers.
7. Give added publicity to each annual award, including permanent chapter recognition in the Year Book.

M. B. T. DAVIES, Editorial Committee Chairman
F. A. COOPER, Educational Committee Chairman
A. H. KENT, Research Committee Chairman

# THE ROUND TABLE

Edited by DONALD T. BARBER

This is a forum for the exchange of actual experiences in internal auditing that have resulted in significant savings, increased efficiencies or the rendering of some special service to management. Every one of our members has several such experiences in his background. By sharing those experiences we will be "Earning our Opportunity" to serve our managements in new and better ways.

Since the experiences are factual, names of contributors will be published only with permission. Please send contributions to

The Round Table
The Institute of Internal Auditors
120 Wall Street
New York 5, N. Y.

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## INTERIM REPORTS

When an audit assignment is lengthy, useful benefits can be gained by preparing interim reports. These reports are informal—perhaps by memorandum or by word of mouth. They should be presented at meetings to allow a full discussion, both for acceptance of the audit findings and for initiating corrective action where weaknesses are disclosed.

This procedure enables the auditor to present his findings while they are still fresh in his mind. The interim reports contain material which can be condensed or copied into the final report, and so save time in the final stages. It permits the auditor to report achievement where his interim recommendations receive prompt attention. It limits the extent of the conference work at the end of the job. And, because the "auditee" is kept in the picture, it helps to strengthen relations between him and the auditor.

The judicious use of this practice can result in a brief final report, confined to significant matters, and therefore more easily readable. All the minor matters will have been dealt with at the intermediate stages. The working papers will be well documented, and wind-up phase of the assignment can be concluded with a minimum of additional work.

## CLEARING TICKS

Many years ago, when checking postings from a book of original entry to a subsidiary ledger, a young auditor made a secret sign—a "clearing tick"—at the foot of each page to denote that he had checked every posting on that page. This was at an interim audit. When the final audit was made, one of his colleagues noted that he had slipped. On two pages there were postings that had not been checked, despite the clearing tick.

The first auditor hated to admit error. So he checked back on these two entries, which reflected allowances to customers for goods returned. He checked personally with the customers; found that they had paid in cash to the bookkeeper when he visited them to collect these small accounts. The bookkeeper had pocketed the money. Further examination showed even more irregularities by the same employee.

Because of this experience, clearing ticks were used as a matter of regular practice . . . not only at interim audits, either. For a bookkeeper may often borrow a book while it is in the process of being audited, or during the lunch-hour, or at other times when the auditor is not present.

* * * * *

## HOW TO SAVE $18,000 A YEAR

The internal auditor of a large oil refinery during his review of the material accounts found that large quantities of anhydrous ammonia, a fluid used in the manufacture of petroleum products, was being purchased in both tank cars and in drum lots. The cost in tank car lots was four cents a pound; in drums the cost was seventeen cents per pound or almost four times as much.

Upon further investigation he discovered that the tank car purchases were received at a large central storage tank at one end of the refinery. The drums were being delivered to an isolated unit at the other end of the refinery. During the first year or so of operation only small quantities of ammonia were used at this unit, but as production increased so did the use of ammonia until at the time of the audit large quantities were being consumed.

The auditor in his report suggested that studies be immediately undertaken with a view to creating facilities so that all ammonia would be received in carloads. In a short time a pipe line from the central storage was extended to the unit. Studies were made of this same problem at two other of the Company's refineries.

In this way, by increasing the receiving facilities and purchasing by carload instead of drum lots, an annual saving of $18,000 resulted. And this be-

cause the internal auditor used a little reasoning when he looked at the entries in a stock ledger instead of just trying to verify their accuracy.

* * * * *

## CONTROLS THAT ARE EXPENSIVE

Sometimes controls that cost very little in additional cash outlay can be expensive when judged by standards of lost production and delay. A case in point is the way we used to deal with our coupon redemptions.

After the coupons were cashed in by customers they were sent to a district sales office. Here the coupons were sent to the General office for reimbursement. The idea behind establishing records at the district offices was that in case a customer should call and complain about not receiving a check they would have a record of pending payments. The record would also balance the coupons sent in by a salesman against his expense report.

The thing that was not realized was that the delays caused by handling the coupons in the district office were the reason for the customers' complaints. Requests were also starting to come in for additional office help to provide for the work in counting and recording the coupons.

The whole problem was resolved by working out a plan to furnish the salesman and our customers with pre-addressed manila envelopes. Coupons are now forwarded direct to the General office. Here they are counted by automatic machines. Reimbursement checks are issued promptly by I.B.M. equipment.

As a result of eliminating one useless control we have saved duplicate labor in handling. This is conservatively estimated at $10,000 a year plus considerable postage expense, and perhaps more importantly, better customer service by a one to four day speed-up in handling time.

Frank E. Walker
Gerber Products Company
Fremont, Michigan

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## MATERIAL HANDLING

Excerpts from an audit report:

(a) During the auditor's observations of operations he found that forgings are loaded on pallets within the freight car. They are then transferred to the ground, unloaded from the pallets, and stacked in the yard for storage. Subsequently the forgings must be re-loaded on

pallets and transferred by lift trucks to the factory department for machining.

It was suggested to the plant manager that palletizing these forgings for storage would reduce the labor cost of unloading 50% and the cost of delivery to machine by 75%. The estimated weekly saving is $250. This suggestion has been put into effect.

(b) It was observed that inter-plant trucking is contracted for on an hourly basis. Because of delays in loading and unloading the costs for shipments vary from six to nine cents a pound. The costs are consistently higher for one company compared with another. The auditor suggested, and the plant manager agreed, that loading and unloading facilities be improved, and further that preference be given to the trucking company operating at the lower cost.

Robert F. Mead
The Oliver Company
Chicago, Ill.

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## TEAMWORK PAYS OFF

With our accelerated decentralization program it became apparent that we must stress uniformity between offices. For this purpose we set up what we call an "Audit Team," even though only two members of the auditing department are on it. This team for the past two years has consisted of nine men from the home office staff. They have sufficient authority to report to management not only on the quality of work performed but also to measure matters of judgment.

The Audit team consists of representatives from Auditing, Policy Service, Methods and Research, Claims, Tabulating and Underwriting.

In the case of our company I am convinced that this team makes a worthwhile contribution to our success. While the men from other departments operate on these teams under the control of the General Auditor, each man examines his own department but is free to call in another member of the team when procedures or functions overlap. This teamwork has paid off in uniform standardized operations. They are flexible enough to be moulded easily to special local conditions.

Mark K. Shaw
Farmers Insurance Group
Los Angeles, Calif.

## FORMS CONTROL

Because an insurance company deals in service no problem exists concerning inventories of manufactured goods as is the case with companies in other fields of endeavour. But we do deal in lots of paper. And we can waste a lot too—both in over ordering, inadequate forms and obsolescence. Our forms supply audit is used not so much to prove the accuracy of the records but to reduce losses. When this audit program was first instituted we found one office with enough of some forms to last 15 years. Some advertising material was not in current demand. It was destined to sit on shelves for years. As the result of our audit numerous changes in ordering procedure were made resulting in considerable saving in money, and of much needed space.

Mark K. Shaw
Farmers Insurance Group
Los Angeles, Calif.

# STUDENT'S DEPARTMENT

Articles in these 21 pages are compiled because of their special help and interest to students.

Edited by STANLEY J. BLAZNEK

## CHALLENGE

One of the definitions of the word "Challenge" is to claim as due; to demand as a right; to lay claim to. This may very well apply to the aggressive individual who is presently in the fortunate position of being a member of a well-directed internal audit staff of a company whose operations may include manufacturing or merchandising and which is directed by a well-organized management team.

Normally, a member of an Internal Audit Department has a good basic educational background and by diligently applying himself to the assignments and responsibilities delegated to him, soon gains the respect of his associates as well as management personnel of areas audited. Through contact and service with all levels of organization, he is afforded the opportunity to gain a thorough knowledge of the business as a whole and how each department contributes to it.

The results of his accepted productive efforts gain for him the right to demand promotion—not literally by personal request but indirectly through recognition and mutual confidence of his capabilities by executives and management personnel with whom he has direct contact.

To lay claim to and maintain the promotion requires the assumption of additional related responsibilities and the successful fulfillment of them, which again presents a challenge for broader achievements.

# COORDINATION OF INTERNAL AND EXTERNAL AUDITING AT INTERIM AND YEAR END

By R. H. MASSOPUST

Manager, Peat, Marwick, Mitchell & Co.

*The author, being a member of the public accounting profession, offers in this paper a good explanation of the respective responsibilities of internal and external auditing. An objective of internal auditing should be to coordinate its work with that of the public accountants in such a way as to eliminate duplication of effort. Not for the purpose of reducing the public accountant's fees, but to obtain the most effective audit coverage for every dollar spent by the client and employer respectively.*

Coordination of the internal and external auditing programs is no accident—it requires a great deal of advance planning and understanding between the internal and external auditors. It will be readily apparent from consideration of the degree of coordination we have achieved with various clients that it is impossible to set forth any magic formula. Our experience has varied tremendously, even between companies of approximately equal size engaged in similar businesses. We haven't yet gone as far as to walk in on the morning of January first, sign the annual report and then return to our office; but we do have engagements in which the internal auditors actively participate in a great many phases of our work. From a very high degree of coordination, our experience varies all the way down to the point where the only contact we might have with the internal auditors is to review their programs and reports. I think the fascinating things about this subject is that a successful program of coordination requires a very active imagination both on your part and on ours. Each company is different and demands a tailor-made plan to achieve a really effective program.

On the positive side, of course, is the fact that we are both trained in accounting. We talk the same language, and theoretically there is little work we perform that you are not also technically qualified to undertake.

RICHARD H. MASSOPUST *is a graduate of Carleton College and Harvard Graduate School of Business Administration. He joined the Minneapolis staff of Peat, Marwick, Mitchell & Company in 1947 and is, at present, Manager in that office.*

*Mr. Massopust is associated with Minnesota Society of Certified Public Accountants, The National Association of Cost Accountants, and is Chairman of the Public Relations Committee of The American Institute of Accountants.*

Over recent years, as we have gained experience with your work we have also gained confidence in it.

On the negative side of the picture, we must always keep in mind that coordination of internal and external audit programs does not mean that you will audit the liabilities and we will audit the assets, or that you will assume the responsibility for cash while we will assume the responsibility for receivables. Such a program is obviously impossible, in view of our independent responsibility to stockholders and other interested outside parties. In order for us to render an independent opinion we must examine and test every phase of the accounting for the year under review. While it is true we may be able to modify the extent of our tests, based on the work you perform during the year, the fact still remains we must also be satisfied that our faith in your work is justified at all times. For this reason the work of the internal auditors must also be subject to our review.

Now there are some other factors which may be either positive or negative, depending on how your particular internal audit staff rates on these points:

1. Independence enjoyed by the internal audit department. Do you have a free hand in determining the scope of your work?
2. Type of personnel. Do you have people trained in auditing?
3. Adequacy of programs. Are they written programs and are they comprehensive in scope?
4. Audit workpapers. Are they kept as a permanent record, and are they well set up and informative?
5. Reports. Are they well written? Do they contain suggestions for revision and improvement of existing procedure, and is a rigorous follow-up made on exceptions and suggestions?

There are some occasions when I almost hesitate to discuss coordination of internal and external auditing as a cost reduction factor, because some people immediately jump to the conclusion that public accountants' fees should be cut in half when such a program is successfully undertaken. It is understood that the salaries paid to the internal auditors and the fees paid to the external auditors are only part of the evaluation. The motivation behind a well coordinated audit program involves a price tag, to be sure, but we must evaluate also the product received in return. Our objective should be to combine our respective auditing efforts in such a way that your company receives the greatest return for each auditing dollar it spends, whether it be for internal or external auditing services.

The examples of coordination that I subsequently cite may have no application to your situation, as they may conflict with your organizational

set-up or with your own thinking on the subject. However, they have worked out well in some situations. I offer them only in the hope that some of these examples might apply to your situation, or that they will serve to spark a new idea, or that they will prompt you to tell the rest of us how you accomplish effective coordination in these or other areas.

This job of coordination is not something we turn on and off during the year. To produce the desired results we must be in touch with you continually throughout the year, as you are probably our best pipeline into the accounting affairs of your company.

I mentioned earlier that a program of coordination requires a great deal of planning. This planning should commence right at the start of the year. At this time we should sit down and review our plans for the entire year. We, of course, like to see you get a complete coverage of all accounting locations, plants, and branches, at least once in each year. We like to see you rotate the dates of examination, and from time to time rotate the in-charge auditor. Advance planning of your visits is beneficial to us also, as it permits us to schedule our personnel in such a way that they are available when you take up your examination at a particular location. We can then have the benefit of your assistance in every way possible during our interim work. We expect, of course, to be advised of any changes in itinerary as they occur throughout the year.

The beginning of the year is also the best time to review the results of last year's work. Were some areas weak? Did we unnecessarily duplicate some of our work, and do either of us have any suggestions for improvement? We like to think that we are advised currently of any proposed changes in accounting procedures and that we are called in to discuss any possible audit implications occasioned by the change, but such is not always the case. You likewise should be in on the ground floor and be consulted prior to the installation of any major change in accounting procedures, but I think it's safe to say that you too are not always so advised. However, you are in the field every day; and when you run into accounting changes which necessitate a change in your program, it's a safe bet that our program should likewise be changed. We would appreciate hearing from you on these matters as soon as they turn up, so that we can sit down and jointly decide the best manner in which to handle any revisions. As you can well appreciate, much of our time can be wasted in the field if we have issued to our people programs that are not up-to-date in all respects.

We found in several instances, and I think it has worked out very well, that the internal auditor serves as a most useful liaison between the accounting department and ourselves during the year. As you know, we must have analyses of certain accounts from both the balance sheet and the income

statement. If we inform you early in the year of the accounts we desire, you can follow through to see that they are analyzed currently so the analyses are available when we walk in for our interim examination.

Throughout the year we like to receive copies of your audit reports and from time to time review certain of your workpapers. We are particularly anxious to determine the scope of your work and the extent of your tests, as this information is of great value to us in determining the scope of our own audit program or in altering our program in the light of findings indicated in your reports. If your program relating to certain accounts is complete and your report indicates that the accounts are in a satisfactory condition, we are justified in modifying our audit procedures to some extent. However, if your audit report contains many criticisms and exceptions, we have no alternative but to increase the scope of our work.

As a substantial portion of the audit time on any engagement is usually spent in the verification of cash, receivables, and inventories, these are logical areas for us to search for ways to coordinate our programs.

Though the audit of cash necessitates a vast amount of detail work, it has proven to be a difficult area in which to reduce the amount of our participation to any substantial degree. Nearly every transaction eventually finds its way to the cash book, either as a receipt or as a disbursement. The cash account is, therefore, the very heart of all business; in order to get the feel of just how a particular enterprise is functioning, we cannot spend less than a certain amount of time, no matter how much cooperation we receive from you. There are certain areas in which you can assist us, and we should of course make use of these opportunities. Where simultaneous cash counts at the same or several locations are required, it is advantageous to have members of the internal audit staff work with us under our supervision. Then, too, in companies having numerous bank accounts and petty cash funds, it is effective to have confirmations prepared under the direction of the internal audit staff and delivered to the external auditor for mailing.

We are sometimes asked to have personnel of the internal audit staff assigned directly to us for certain detailed cash work. With cash work, as you well know, most of our tests are evidenced only by the accountant's initials in the program. In our position, it could prove most embarrassing to have the initials of an employee of our client as the only evidence of work done. To combat this obvious defect, it would be necessary to have the internal auditor set up workpapers and schedules which we could review and test check as evidence that the work had been properly done. While it is true that by this procedure we could reduce the amount of our time, the overall audit time would be increased by the necessity of having the internal

auditor prepare a permanent record of his work. Now if the existence of an internal audit staff is solely to reduce fees paid to the public accountants, I guess we would have to say that this approach might be successful. However, if our goal is to obtain the most value for each auditing dollar spent, then I believe that perhaps this method falls somewhat short. Another approach to our problem is the consideration that we, the public accountant, must perform certain audit operations in order to render our certificate. This being true, it is a duplication of effort for the internal auditors to perform the identical operations. I have in mind the confirmation of bank balances at the year end: it may be that, since we will perform this work, it is unnecessary for the internal auditors to request such confirmation during the year.

Many of you have probably worked out satisfactory arrangements for coordination of procedures for the confirmation of receivables. The principal considerations are that we must know that the basis of your selection of accounts to be confirmed is similar to ours, that some large and some small balances are selected, that consideration is given to the selection of delinquent and past due accounts, and that mailing procedure is adequate. An effective confirmation program on your part means that we are justified in cutting down on the number of requests we must send out. A type of program that works out very well, for locations which we may visit only at the year end for inventory observation but which you may visit on an interim basis, is to have you send us at that time a trial balance and selected confirmations. We can check out the confirmations, control the mailing, satisfy ourselves as to adequacy of the coverage, and test check the trial balance to the detail ledger cards when we visit the location to observe inventory. Such an arrangement serves to reduce our out-of-town work, thus minimizing expenses to some degree.

The clearing of accounts receivable exceptions is often a sticky and time consuming task. In most engagements it has worked out very well to turn those exceptions over to you for proper explanation and follow-up. We, of course, like to have these confirmations returned to us with detailed explanations in writing.

Work on inventories, particularly as to the observation of physical inventories, is an area in which you can help us a great deal, especially in those instances where your company has numerous inventory locations. With your help we can materially reduce the number of locations we must visit. There are also opportunities to reduce the amount of work we have to do in the testing of unit prices and extensions of inventories.

From time to time your staffs will undoubtedly undertake special examinations, such as prepaid insurance, pay rolls, surveys of certain internal

control procedures, and the like. When such special examinations are contemplated, we should be advised so that we can modify our program accordingly.

We have found your services to be valuable also in those instances where our test checks of a certain operation indicate that we may have hit a weak or soft spot. Rather than expand our program at this point, if we can call you in to make these additional checks, we can realize a substantial saving in our time. I have in mind an instance where our checking of year end inventories disclosed many errors. We were disturbed, of course, because our test covered only a few of the numerous inventory locations. The internal auditors were called in and worked many, many hours to establish the correctness of these inventories. In this particular case, the overages and shortages tended to offset each other pretty well in the aggregate, and had no material effect on the balance sheet or the income statement. The fact remains, however, that our test checks indicated that there might be a substantial overage, and until we were satisfied on that point a clean certificate would have been impossible. By utilizing the internal audit staff we were able to satisfy ourselves, and to do so without much further effort on our part.

In instances where the number of accounting locations is few, the internal audit staff is generally pulled out of the field at the year end so as not to have your regularly scheduled examinations conflict with our visits. Where such a procedure is followed, you can be of a great assistance to us at the year end in the preparation of workpapers and in coordinating the work of the accounting department so that we receive the analyses we require in accordance with the pre-arranged time schedule. We can use you for trouble-shooting purposes, and for the preparation of certain information that we may present in our detailed reports. You, of course, are much more help to us than accounting department clerical help, as you are more familiar with our procedures and requirements.

In a company where there are numerous accounting locations we may utilize your help to the best advantage by having you make complete examinations of certain locations at the year end, thereby reducing the number of locations at which we must be present.

In conclusion, I believe it is clear that coordination of the internal and external auditing programs can be accomplished in a variety of ways, the degree of coordination we achieve being dependent upon many, many factors. I think the important thing to realize is that we still have a long way to go before we reach the desired goal. The course we choose in each given situation is perhaps uncharted, and we must continually try out new ideas until we find the solution which is tailor made to your particular situation.

# AUDITING STANDARD COST AND EXPENSE BUDGETS

By L. EDWARD MICCA

Director of Budgets, The National Supply Company

The purpose of this article, which the author capably conveys, is to briefly review the principles involved in developing standard costs, including a review of the information sources normally used in their computation, and to outline the requirements for a detailed audit of the three elements of product cost; *i.e.*, material, direct labor and burden.

A standard cost system assumed is based on completely engineered standards. However, the general approach developed may be applied with equal ease and validity to standards based on past averages or selected historical experience.

## AUDITING PRODUCT STANDARD MATERIAL COST

Product standard material cost is developed from two factors: price and quantity. The price factor is discussed under the heading of "Standard Material Cost" and the quantity factor under the heading of "Standard Material Allowances."

### *Standard Material Cost*

Calculation of standard material prices, the first step in developing standard material cost, requires the establishment of normal purchasing quantities for each item of raw material in the inventory accounts. It is necessary that these normal purchasing quantities be realistic in terms of manufacturing considerations and that they are realistically priced. Their development should, therefore, be a joint effort of the Purchasing, Industrial Engineering, Production Control and Accounting Departments.

Auditing the standard material costs can be accomplished in two steps. The first step is a review of the normal purchase quantities established for each item of inventory to be sure that these are not only realistic quantities but that they also tie in with the standard manufacturing quantities used in the development of product cost. Having checked the accuracy of this factor, the second step involves checking the accuracy of standard purchase prices (including freight cost based on the normal purchasing quantities now established) for each item of raw material in the inventory accounts.

In reviewing these standard prices, the auditor should ask for the source data used in their development. This data should be obtained from the Purchasing Department since it is that department's responsibility to de-

velop these prices based on the normal source of supply. Since a date is normally established on which new standard purchase prices are to be predicated, the auditor should check the prices as of that date against the vendor's published catalog or the vendor's invoices on file for these materials. If neither of these is available, the auditor should ascertain from the vendor the applicable prices on the established date.

After these steps have been completed, the auditor should be able to conclude whether or not standard purchase prices have been developed in accordance with company policy and represent the prices in effect. If the conclusion is positive, the audit of standard material cost may be carried to its conclusion by: (1) checking the application to the standard cost card, (2) pricing of the raw material inventory, and (3) subsequent analysis of any purchase price variances that develop.

*Standard Material Allowances*

Having determined the "Standard Material Cost" for each item of raw material in the inventory accounts, it is now necessary to develop and audit the "Standard Material Allowance" for each product in the product line. With this latter factor accurately measured, it is a simple matter to complete the audit of product standard material cost.

The first step is to develop the standard material specifications for each product. Developing these specifications, as a rule, is the responsibility of the Engineering Department. Next, on processing operations, it is necessary to develop what the standard yield losses would be in order to determine the standard gross material allowance of a product. In certain industries it is necessary to develop these by the type of scrap loss which will be incurred.

For example, in the seamless pipe industry it is necessary to determine for each size and grade of product (1) what the standard loss will be from descaling and scarfing operations to remove surface defects in the steel blooms, (2) standard scale loss in the furnace operations, (3) loss due to defective pieces of pipe produced and (4) loss due to cutting the ends of each piece of pipe, etc. The standard material allowance should take into account separately each type of yield loss in preference to one overall average yield loss. The reason for this is that the gross material cost of the product is credited with the standard value of the scrap losses. Since the value of the scrap depends upon the type, there is a substantial difference between scale scrap prices and pipe scrap prices.

The standard specifications and yields used in developing the standard product material allowances are developed by the Industrial Engineering Department. It is the auditor's responsibility to first check the standard material specifications by comparing the specifications issued for a product

against the actual materials that have been used. If they do not agree, further investigation is necessary to find out whether this was due to using materials other than those specified or to changes in the specifications.

The standard yield allowances developed for each product should then be reviewed. This can be done best by comparing them with the actual experience over a period of time. If this comparison reveals major differences in any of the yield factors between the standard established and the actual, it does not necessarily mean that the standard as developed is wrong. There is always the possibility that the actual performance may have been either very poor or exceptionally good in any one period. All these factors must be weighed in reaching a conclusion. The auditor, being satisfied that the standard material allowances have been accurately established, should complete the audit of the standard product material cost by checking to determine that the standard material prices were accurately applied and extended to both raw materials and scrap allowances. (Figure 3, page 79).

## AUDITING PRODUCT STANDARD DIRECT (OR PRODUCTIVE) LABOR COST

Product standard direct labor cost is, like product standard material cost, developed from two factors, quantity and price. The quantity factor is discussed under the heading of "Standard Times" and the price factor under the heading of "Standard Direct Labor Crew Rates."

### *Standard Times*

Development of Standard Times requires that the following be established for each of the operations required to process each product: (1) Engineered standard *running times,* (2) Engineered standard *set-up times.*

It is, of course, assumed that for each product, standard production routings have been established listing the required operations in proper sequence according to standard practice, and that engineered standard running times have been established for each such operation. Such standard routings and running times should give separate consideration to each of the various productive operations performed on each product. (Figures 1 and 2, pages 76-78). All operations, from the raw material to the finished product must, in each case, be identified. A further required step is the establishment of standard order quantities to absorb the studied standard

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set-up times into the product standard cost. The importance of this step lies in the fact that the standard quality established for the absorption of set-up time can radically affect the total cost of the product. If, to consider one aspect of this relationship, selling prices based on standard costs are established, serious distortions in price relationships might ensue if the allowances for set-up time in the costs have been established incorrectly.

An example of the effect on machine set-up cost on the unit cost of a product will serve to clarify the foregoing remarks. Assume that the product is to go through six different machine operations and that set-up time for each operation is two hours, or a total of twelve hours. Assume further that the average labor and burden cost per hour of machine set-up time amounts to $25. Thus the total cost for set-up time amounts to $300. If a standard order quantity of 100 pieces is assumed, the per unit set-up cost is $3.00. However, if a standard order quantity of 1,000 pieces is established, the per unit set-up cost is one-tenth the former amount or thirty cents. Thus the impact on the earnings report of pricing on the latter basis and producing on the former is apparent.

*Standard Direct Labor Crew Rates*

Development of standard direct labor crew rates (the price factor in the "product standard direct labor cost") requires a determination of the type and number of personnel needed to meet the requirements of the above-noted "Engineered Standard Running Times." Once these data are available, the development of standard direct labor crew rates can proceed by use of the indicated occupational rates based on the union labor contracts currently in effect. The first step in developing standard direct labor crew rates requires an analysis to determine direct labor crew requirements for each operation. In this determination the nature of the production process must be considered. There are certain operations where one man operates two or three machines at one time. On the other hand, in certain processing operations the services of from one to thirty or more men may be required on a single operation.

The next step is to develop standard direct labor occupational rates, based on the union labor contracts in effect. After the necessary direct labor occupational rates have been established, determination of standard direct labor crew rates to be applied to the "Standard Engineered Running and Set-Up Times" may proceed. The result of this application produces the individual standard direct labor cost for *each operation*. It is then simple to sum the standard direct labor cost, operation by operation, to arrive at a "*Product* Standard Direct Labor Cost." (Figure 3, page 79.) In instances where productive labor is paid on the piecework rate system, the above procedure is unnecessary. In such cases the piecework rate is the standard

direct labor cost for the related operation. Other operations may have a combination of piecework rate plus an hourly rate. In such cases the direct labor standard cost becomes the piecework rate per unit plus the standard cost per unit computed by the application of the labor rates to the standard times.

Auditing the product standard direct labor costs under the procedure outlined above will now be discussed in detail, indicating for each step the type and amount of investigation required to validate the product standard direct labor cost.

1. *Standard Routings* (Figures 1 and 2, pages 76-78)—The auditor should first ascertain that the Cost Department used the proper product routing prepared by Industrial Engineering Department in developing the standards. The proper routings should then be compared with the routings actually used on completed orders. If there is any discrepancy between the standard routing and the actual routing, the auditor should discuss these discrepancies with the Industrial Engineering Department. Such discussions may reveal (1) that the engineers have found a more economical method of routing the product, or (2) that it had been necessary to use substitute operations.
2. *Engineered Standard Running Times*—Effective auditing requires that the reliability of these engineered standard running times be checked by comparing them with previous actual experience. If wide variances between the actual running times and the standard engineered times are discovered, these findings should be discussed with the Industrial Engineers with the objective of determining whether the actual times are due to poor performances or to errors in the computation of the standard times.
3. *Engineered Standard Set-Up Times*—The auditor should be prepared to find in this area, numerous and, at times, substantial variances between historical set-up times and engineered standard set-up times. The amount of time it takes to change over the set-up on a machine is determined (1) by the type and size product to be made and (2) by the type of product and/or size of the product previously scheduled. Therefore, the Industrial Engineers, in developing their set-up times, must necessarily try to anticipate the normal type of change. A realistic audit of this cost must, therefore, take into consideration the type of set-up changes actually made as compared to the standard set-up times as established against the perspective of historical information or desired production scheduling sequences. In addition, the auditor should (a) compare standard manufacturing quantities as established with the record of past expe-

rience and review any material variations with the Production Control Department; (b) compare accuracy of data on standard direct labor crews with actual past practice; (c) check standard direct labor occupational rates against the labor contracts in effect at the time the standards were established.

At this point, being satisfied that the standard running times and per unit set-up times have been accurately established, the auditor may complete his examination of product standard direct labor cost by checking the accuracy of the application of times and rates to the standard cost cards. (Figure 3, page 79).

*Auditing Product Standard Burden Cost*

The material and direct labor content of product cost can, with a great degree of accuracy, be determined for all products. The third element, that of standard burden or overhead rates to be applied to the product cost, offers a wide difference of opinion as to the best method to allocate this cost to the product. The material below outlines certain accepted concepts on developing standard burden rates and describes what the auditor may look for in his review of standard burden rates.

*Developing the Normal Burden Budget*

The term "normal" refers to burden budgets developed for a one-year period assuming a normal activity level. Separate normal budgets are developed for each productive and non-productive manufacturing responsibility. These normal budgets provide the basis, as outlined later, for developing separate standard burden rates for each producing responsibility. These rates are then used, for the year in question, to allocate overhead to product cost. Thus they constitute a mechanism for arriving at a product standard burden cost that takes into account the degree to which different producing responsibilities were involved in the production of the particular product being costed.

A normal activity level is one sufficient to produce the volume of production required to provide a fair rate of return on the investment. This production level is translated into the number of direct or productive hours required per month, assuming a product mix which can be scheduled to maintain a fairly constant work load in each producing responsibility. The productive hours thus determined are compared with the actual number of direct labor hours needed to operate and support the limiting or key items of equipment, three shifts per day for five days per week less ten shut-down days for vacation and less legal holidays agreed upon in the union contract. If this latter conclusion is greater than that productive level required to produce a satisfactory rate of return on investment, it is considered

the normal level of activity for the purpose of establishing the product standard burden cost. The normal activity of a plant is changed only when the capacity of the plant is increased or decreased by the addition or deletion of production facilities.

With the direct labor hours for the normal activity level established, allowances for the various components of burden cost are developed and a standard burden rate is calculated as follows:

*Indirect Labor*

The next step is to estimate, for each responsibility, the indirect labor crews required at the normal level of operation. The indirect labor requirements for operating the plant at the normal level for service, maintenance, overhead, utilities and producing responsibilities are determined through analysis of past history and conferences between department superintendents and budget personnel.

*Fringe Benefits*

Allowances for all payroll fringe benefits, such as workmen's compensation, social security, taxes, group insurance, pensions, holiday pay and vacation wage allowances for all direct and indirect labor indicated on the normal budget for each responsibility are developed.

*Utilities*

Standard purchase prices for all utilities are developed. Studies are then made of the utility requirements at the normal activity level in each responsibility. Total requirements of each utility are determined and included in the normal budget of the individual utility responsibility.

*Operating Supplies: Repair Materials: Perishable Tools*

Variable rates per unit of measure are established for each responsibility and are included in the normal budget. With few exceptions, these units are direct labor or machine hours.

*Depreciation*

Depreciation is included in the normal budget at established normal depreciation rates applied on acquisition cost for all equipment, machinery and buildings. These normal rates apply although the equipment is fully depreciated or is being written off on the basis of rapid amortization.

*Property and Personal Taxes*

Property and personal taxes are included on the basis of the estimated cost for the year. These estimates are developed by the Tax Department.

*Miscellaneous Classifications*

All other miscellaneous classifications of expenses are determined on an applicable basis and included in the normal budgets.

*Recirculated Expenses*

The normal budgeted allowances for all overhead responsibilities, utilities, service and maintenance responsibilities are recirculated to the producing responsibilities on the basis of standard usage practices.

*Developing Burden Rates*

The total normal budgeted expenses both incurred and recirculated are used to develop burden rates to be used for the operations in each producing responsibility.

Once the soundness of the normal budgets has been established, the next step is to develop the standard burden rates for the producing responsibilities. (Figure 3, page 79). These rates can be further broken down within producing responsibilities to the "point of tool charges" for items of expense that can be directly applied to specific machines, together with a floor rate for items of a general nature. Items of expense that are normally included in such "point of tool charges" are: (1) Depreciation, (2) Repairs, (3) Tooling, (4) Power, (5) Occupancy, (6) Personal property taxes.

*Auditing Normal Burden Budget*

With the completion of the above, a major step in the development of standard burden rates is concluded. It is the auditor's responsibility to review the development of these normal budgets to determine that they conform with established company policy.

The first step in the audit procedure requires a review of the normal direct labor hours established for the plant as a whole and for each producing responsibility. If there is any appreciable change from those established in the previous year, the auditor must determine that these changes are justified. If no changes have been made, it should be ascertained that there has been no reason to increase or decrease these hours.

To illustrate the importance of this point, in a review of the normal hours established at one plant, it was found that the total normal hours established in the new budget for the plant had not been changed from those of the previous year. However, during the year a major line of products had been moved from the plant to another location, and new products were developed. In this change the required level of production hours was decreased considerably, and the ratio of the direct labor hours in the producing responsibilities was radically changed. If the normal direct labor hours had not been

corrected to take these changes into consideration, a large unfavorable variance in the affected responsibilities would have resulted.

In addition, the editor should perform the following:

*Indirect Labor*

Review the normal indirect labor crews developed for each responsibility. These can be compared to past actual practices regardless of the previous activity level or prior year budgets. Discuss the labor crews with the shop superintendent to determine whether, in his opinion, they are realistic. Check the labor rates applied to assure they are in agreement with the occupational rates called for in the union contract.

*Fringe Benefits*

Determine that the proper rates were used for such items as workmen's compensation, social security, taxes, group insurance, pensions, etc., and have been applied correctly to the total direct and indirect labor budgeted.

*Utilities*

Check the total utility requirements developed based on past historical data and ascertain that the rates used are the current rates and not past averages. Discuss them with the Engineering Department.

*Operating Supplies: Repair Materials: Perishable Tools*

Determine that price changes have been taken into consideration in establishing the variable rates per unit of measure, and that large non-recurring past charges, particularly for repair materials, have been eliminated.

*Depreciation*

Depreciation can be checked against the rates established. Make sure that normal rates have been applied on the true acquisition cost.

*Recirculated Expenses*

Review the soundness of the basis used for recirculating costs from indirect or overhead responsibilities to the producing responsibilities. Determine that company policies were followed.

Review and check the bases for developing the machine burden rate and determine that the indirect expenses allocated to each machine agree in total with the normal budget developed for each producing responsibility. After the soundness of the burden rates, as developed, has been established, verify that the burden rates applied on the standard cost cards are accurate.

*Operating Budgets*

The difference between the normal budgets, as previously discussed, and operating budgets is that normal budgets reflect standard operating cost at a normal level of activity and are used to develop standard burden rates,

while operating budgets are the allowances made at the actual current level of activity.

The operating budget allowance data, generally, is the same as that used to develop the normal budget. The only exception to this rule is when a major change occurs in the price of any item of expense. For example, if a general wage increase is granted during the interim period, the allowance in the future should be based on the new labor rates.

If electric, gas or water rates are increased or decreased, the new rates should be used as a basis for the allowance. In other words, the units allowed as a rule are never changed, but the rates applied to the allowed units should be based on current cost.

In auditing the budget allowances for any responsibility, the following are some of the items which should be checked thoroughly:

1. Standard hours earned—This is perhaps the most important step since it establishes the budget allowance for direct labor and for all other items of expense which are variable with productive earned hours.
2. That the correct indirect labor crew allowances were made at the period activity level.
3. That expenses of a fixed nature are allowed as such.

*General Remarks*

The aforementioned to this point has covered the development and auditing of standard costs and normal budgets. However, the finest standard cost system that can possibly be developed is of no value if a company does not have a sound procedure for accurate reporting of production data (production reports, time reports, requisition, etc.). Any analysis of variances would be worthless if the allowances were predicated on inaccurate volumes of production.

It is therefore recommended that reporting procedures be subjected to continuous study and review to make sure that they are sound. The responsibility of an auditor is not only to determine whether the standard cost and normal budgets have been properly developed in accordance with established company practices, but also to suggest to management methods that could improve on the practices in existence.

**NOTES:** See PROCESS Sheets 2 thru 7 for SEQUENCE of MILL OPERATIONS.
See CODE Sheets for PRODUCT IDENTIFICATION.

| CODE | DESCRIPTION |
|---|---|
| 1 | DESCALING -- Removal of scale from blooms by the use of flame impingement. |
| 2 | SCARFING -- Removal of surface defects from blooms by the use of a torch. |
| 3 | CHIPPING -- Removal of surface defects from blooms by the use of chipping machinery. |
| 4 | CHIPPING -- Removal of surface defects from rounds by chipping. |
| 6 | ROLLING ROUNDS -- The conversion of blooms into billets in the Bar Mill. |
| 7 | HOT SIZING -- The process of reheating and running tubes through sizing rolls to correct size. |
| 8 | COLD SIZING -- Running cold pipe through sizing rolls to correct size. |
| 11 | ROLLING TUBES -- The conversion of round billets into seamless tubes in the Hot Mill. |
| 12 | ROLL STRAIGHTENING HOT ROLLED TUBES -- Before cutting and/or heat treating operations. |
| 13 | ROLL STRAIGHTENING QUENCHED AND DRAWN CASING -- After Selas Treatment. |
| 14 | ROLL STRAIGHTENING UPSET TUBES -- After upsetting and heat treatment. |
| 15 | PRESS STRAIGHTENING HOT ROLLED TUBES -- On hydraulic press before cutting. |
| 16 | PRESS STRAIGHTENING UPSET TUBES -- After upsetting and heat treatment. |
| 17 | ROLL STRAIGHTENING HOT ROLLED TUBES -- After heat treatment. |
| 18 | CUTTING TO PLAIN END -- All cutting operations on tubular product to produce Plain End pipe. (Except coupling blanks.) |
| 21 | UPSETTING ONE BOX END PER PIECE -- Includes Selcar coating where necessary. |
| 22 | UPSETTING ONE MALE END OR ONE WELDING END (SPANGWELD) PER PIECE -- Includes Selcar coating where necessary. |
| 24 | GRINDING -- When upset pipe develops a flash or fin, this must be ground off. |
| 27 | SHOT BLASTING OUTSIDE ONLY. |
| 28 | SHOT BLASTING AND/OR PEENING INSIDE ONLY. |
| 29 | SHOT BLASTING OUTSIDE AND SHOT BLASTING AND/OR PEENING INSIDE -- (Operations 27, 28, 29 utilize a steel grit blast to remove scale enabling better inspection, prepare for plastic coating and with heavier grit to close surface "pores".) |
| 30 | FACING -- Turning the ends of pipe to present a clean square end. This operation applies to products which are faced but not chamfered or bored. |
| 31 | TESTING -- This includes testing, assembling, packing, loading, stencilling, and oiling of finished pipe. |
| 32 | FACING, CHAMFERING, BORING -- Turning the ends of Oil Well Tubing, cutting a slight bevel or chamfer, and boring lightly to clean inside. |
| 33 | THREADING MALE ENDS -- Cutting common API type threads on product. |
| 34 | FULL TEST -- Spangweld drill pipe test for weld strength. |
| 35 | PARKERIZING -- Coating female end of Oil Well Tubing with Parker Lubrite. |
| 36 | TURNING AND FORMING -- Turning down ends of Shrink Thread Drill Pipe preparatory to threading. |
| 38 | TURNING AND BORING WELDS -- After tool joints have been welded on Spangweld Drill Pipe. Also turning down welds of API tool Jointed Drill Pipe. |

| BOOK NUMBER | SPANG-CHALFANT<br>DIVISION OF THE NATIONAL SUPPLY CO.<br>PRODUCT MANUFACTURING STANDARDS | | | | | REVISED BY<br>CHECKED |
|---|---|---|---|---|---|---|
| | PREPARED | MADE UP | CHECKED | APPROVED | ORIGINAL ISSUE | REV. & DATE |
| | L.&.E. | L.S.S. | L.&.E. | J.S. | SEE NOTE ABOVE | |

Figure 1.—Outlines the description of operations and the code numbers relating thereto in a seamless pipe mill.

| | |
|---|---|
| | * The preliminary issue dated 7/5/54 printed on yellow paper, for inventory purposes only, is superseded by these sheets dated Aug. 11, 1954. |
| **CODE** | **DESCRIPTION** |
| 39 | WELDING (PIN END) TOOL JOINT ON SPANGWELD -- Includes stress relief at weld by induction heating. |
| 40 | WELDING (BOX END) TOOL JOINT ON SPANGWELD -- Includes stress relief at weld by induction heating. |
| 41 | APPLYING TOOL JOINTS -- Includes bucking on, shrinking on tool joints, and welding on API tool joints. |
| 42 | REMOVING TOOL JOINTS -- (i.e. cutting off Spangweld Tool Joints.) |
| 46 | MACHINE TURNING AND BORING -- Special ends and joints. |
| 48 | MACHINE TAPPING -- Tapping special ends and joints on tapping machine. |
| 49 | MACHINING AND THREADING MALE ENDS -- Specialty products. |
| 50 | FACING AND CHAMFERING -- Applies to facing and chamfering of Drill Pipe in the Finishing-Cutting Department. |
| 51 | CUTTING COUPLINGS -- Making coupling or accessory blanks from stock. |
| 52 | BORING COUPLINGS -- Boring coupling blanks to produce Bored Couplings. |
| 53 | TAPPING COUPLINGS -- Cutting thread on inside of couplings. |
| 54 | GALVANIZING -- Applying thin coat of zinc by electrolysis to protect and lubricate female specialty threads. |
| 55 | GALVANIZE & PAINT COUPLINGS -- Applying thin coat of zinc by electrolysis to protect and lubricate threads and paint outside of couplings. |
| 56 | PLASTIC COATING — Coating and baking product with special paints, oils, or lacquers in Responsibility 138. Applies to pipe or couplings. |
| 58 | PICKLING -- Removes scale - Tubes or Rounds. |
| 59 | MACHINING AND THREADING BOX ENDS --Specialty products. |
| 63 | CUTTING OFF AND BORING ONE END -- Machine operation which produces One End Bored Couplings. |
| 64 | BORING SECOND END AFTER OPERATION #63 -- Couplings only. |
| 65 | NORMALIZING -- Normalizing accomplishes grain refinement. It consists of heating the product above the upper critical temperature and cooling in air. |
| 66 | DRAWING -- Drawing accomplishes both softening and toughening. It consists of heating product to a sub-critical temperature and cooling in air. |
| 67 | ANNEALING -- Annealing accomplishes softening. It consists of heating the product above the critical temperature and cooling at a controlled rate. |
| 68 | PRE-DRAW -- Pre-drawing accomplishes the relief of manufacturing and cooling stresses. It consists of heating product to a sub-critical temperature and cooling at a controlled rate. ONLY DONE IMMEDIATELY AFTER ROLLING. |
| 69 | STRESS RELIEVE -- Relieves the manufacturing and cooling stresses. |
| 70 | QUENCHING AND DRAWING — Quenching accomplishes hardening. It consists of heating product above the upper critical temperature in the Selas Furnace and cooling very rapidly. Quenching is invariably followed by a draw. |
| 71 | STRESS RELIEVE AND SIZING -- Relieves the manufacturing and cooling stresses and passes through sizing rolls to correct size. |
| 86 | TORCH CUTTING -- Burning pipe to single random which had been rolled double random. |
| **DIRECT LABOR OPERATIONS - DESCRIPTION SEAMLESS PRODUCTS** | **MISC.-MILL PROCESS** Sheet 1 |

Figure 1.—Outlines the description of operations and the code numbers relating thereto in a seamless pipe mill.

**NOTES:** * See Description of Operations on Misc. Mill Process, Sheet 1.
† No. 1 Mill.
†† No. 2 Mill.

See product identification on DP CODE, Sheet 1 & 2.

◆ The preliminary issue dated 7/6/54 printed on yellow paper for inventory purposes only, is superseded by these sheets dated Aug. 15, 1956.

| INDEX OF OPERATIONS NO. | TITLE * | RESPONSIBILITY NO. | PRODUCT CODE | GRADE | OD SIZES | OPERATIONS IN SEQUENCE PERFORMED → |
|---|---|---|---|---|---|---|
| 1 | DESCALE | 102 | C1 | H, J | 4 1/2" thru 11 3/4" | 2-6-11-2-16-23-31 |
| 2 | SCARF | 107 | C1 | H, J | 13 3/8" | 2-6-11-21-11-16-23-31 |
| 3 | CHIP | 103 | C1 | H | 10 3/4", 11 3/4", 13 3/8" | 1-3-6-11-2-15-15-16-23-31 |
| 8 | ROLL ROUND | 104 | C2 | J | 4 1/2" thru 9 5/8" | 2-6-11-12-16-23-31 |
| 11 | ROLL TUBE | 111/112 | C2 | H | 5" & 5 1/2" & 6" † | 1-3-8-11-25-15-16-23-31 |
| 12 | ROLL STRAIGHTEN | 121 | C2 | H | 5", 5 1/2" & 6" †† | 1-3-6-11-15-13-13-16-23-31 |
| 13 | ROLL STRAIGHTEN | 121 | C2 | H | 6 5/8" thru 9 5/8" OD | 1-3-5-11-12-20-15-16-23-31 |
| 14 | ROLL STRAIGHTEN | 121 | C2 | SH | 4 1/2" thru 7 5/8" | 2-6-11-12-20-13-21-16-23-31 |
| 15 | PRESS STRAIGHTEN | 121 | C2 | SH | 8 5/8" & 9 5/8" | 2-6-11-12-10-21-15-16-23-31 |
| 16 | PRESS STRAIGHTEN | 121 | C3 | H, J | 4 1/2" thru 11 3/4" | 2-6-11-12-16-31 |
| 17 | ROLL STRAIGHTEN | 121 | C3 | H, J | 13 3/8" | 2-6-11-21-11-16-31 |
| 18 | CUT | 122 | C3 | H | 4 1/2" thru 13 3/8" OD | 1-3-6-11-12-21-15-16-23 |
| 21 | UPSET BOX END | 128 | C3 | SH | 4 1/2" thru 7 5/8" OD | 2-6-11-12-20-13-21-11-16-23 |
| 22 | UPSET PIN END | 128 | C3 | SH | 8 5/8" & 9 5/8" | 2-6-11-12-10-21-15-16-31 |
| 31 | ASSEMBLE AND TEST | 133 | C8 | J | 10 3/4" & 11 3/4" | 2-5-11-12-16-23-31 |
| 33 | THREAD | 131 | C8 | J | 13 3/8" | 2-6-11-21-11-16-23-31 |
| 49 | MACHINE/THREAD PIN | 132 | C11/C11X | J | 5" thru 7" except 7" 35# and 38# | 2-6-11-12-16-21-22-40-15-31 |
| 54 | GALVANIZE | 132 | | | | |
| 59 | MACHINE/THREAD BOX | 132 | C11/C11X | J | 7" 35# and 38# also 7 5/8" thru 9 5/8" | 2-6-11-12-16-21-22-45-15-54-31 |
| 65 | NORMALIZE | 124 | | | | |
| 68 | PRE DRAW | 124 | C11/C11X | H | 5" & 5 1/2" & 6" † | 1-3-6-11-16-17-16-21-22-15-16-45-15-54-16 |
| 69 | STRESS RELIEF | 124 | C11/C11X | H | 5", 5 1/2" & 6" †† | 1-3-6-11-12-16-21-22-15-16-45-15-54-31 |
| 70 | QUENCH & DRAW | 124 | C11/C11X | H | Over 6" | 1-3-8-11-16-17-12-15-16-45-15-54-31 |
| 71 | STRESS RELIEVE/SIZE | 124 | C11/C11X | P | All | 1-3-6-11-12-16-22-21-15-16-45-15-54-16-45-15-16-31 |
| | | | C30 | H, J | 4 1/2" thru 11 3/4" | 2-6-11-12-16-31 |
| | | | C30 | H, J | 13 3/8" | 2-6-11-21-11-16-31 |
| | | | C30 | SH | All | 2-5-11-12-20-13-21-15-16-31 |

DOCS NUMBER

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY CO
PRODUCT MANUFACTURING STANDARDS

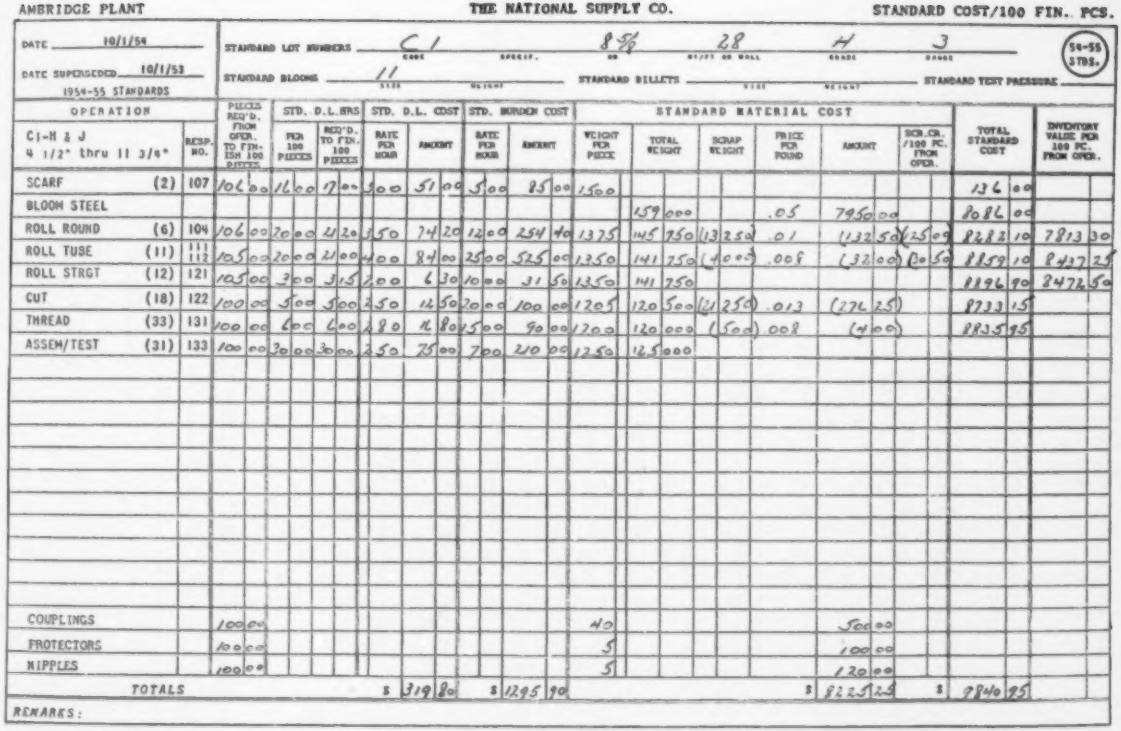
| PREPARED | ISSUED BY | CHECKED | APPROVED | ORIGINAL ISSUE | REV. & DATE |
|---|---|---|---|---|---|
| L.R.C. | R.A.B. | L.R.C. | J.S.C. | SEE NOTE ABOVE ◆ | |

REVISED BY 1
CHECKED 1

**CASING**
**SEQUENCE OF MILL OPERATIONS**
**Seamless Products**

**MISC. MILL PROCESS**
Sheet 2

Figure 2.—Outlines the standard sequence operation sheet to produce various finishes of casing pipe.



AMBRIDGE PLANT — THE NATIONAL SUPPLY CO. — STANDARD COST/100 FIN. PCS.

DATE 10/1/54 — DATE SUPERSEDED 10/1/53 — 1954-55 STANDARDS

STANDARD LOT NUMBERS: CODE C1 — SPECIF. 8 5/8 — WT/FT OR WALL 28 — GRADE H — GRADE 3 — 54-55 STDS.

STANDARD BLOOMS: SIZE 11 — WEIGHT — STANDARD BILLETS: SIZE — WEIGHT — STANDARD TEST PRESSURE

| OPERATION | RESP. NO. | PIECES REQ'D. FROM OPER. TO FIN-ISH 100 PIECES | STD. D.L. HRS PER 100 PIECES | STD. D.L. HRS REQ'D. TO FIN. 100 PIECES | STD. D.L. COST RATE PER HOUR | STD. D.L. COST AMOUNT | STD. BURDEN COST RATE PER HOUR | STD. BURDEN COST AMOUNT | STANDARD MATERIAL COST: WEIGHT PER PIECE | TOTAL WEIGHT | SCRAP WEIGHT | PRICE PER POUND | AMOUNT | SCR. CR. /100 PC. FROM OPER. | TOTAL STANDARD COST | INVENTORY VALUE PER 100 PC. FROM OPER. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C)-M & J 4 1/2" thru 11 3/4" | | | | | | | | | | | | | | | | |
| SCARF (2) | 107 | 106.00 | 16.00 | 17.00 | 3.00 | 51.00 | 5.00 | 85.00 | 1.500 | | | | | | 136.00 | |
| BLOOM STEEL | | | | | | | | | | 159.000 | | .05 | 7950.00 | | 2086.00 | |
| ROLL ROUND (6) | 104 | 106.00 | 2.00 | 2.12 | 3.50 | 7.42 | 12.00 | 25.44 | 13.375 | 145.750 | (13.250) | .01 | 132.50 | (2.50) | 8282.10 | 7813.30 |
| ROLL TUSE (11) | 111 112 | 105.00 | 2.00 | 2.10 | 4.00 | 8.40 | 25.00 | 52.50 | 13.350 | 141.750 | (4.000) | .008 | (32.00) | (0.50) | 8859.10 | 8427.25 |
| ROLL STRGT (12) | 121 | 105.00 | .300 | 3.15 | 2.00 | 6.30 | 10.00 | 31.50 | 13.350 | 141.750 | | | | | 8896.90 | 8472.50 |
| CUT (18) | 122 | 100.00 | 5.00 | 5.00 | 2.50 | 12.50 | 20.00 | 100.00 | 1.205 | 120.500 | (11.250) | .013 | (274.25) | | 8733.15 | |
| THREAD (33) | 131 | 100.00 | 6.00 | 6.00 | 2.80 | 16.80 | 15.00 | 90.00 | 1.200 | 120.000 | (1.500) | .008 | (4.00) | | 8835.95 | |
| ASSEM/TEST (31) | 133 | 100.00 | 3.00 | 3.00 | 2.50 | 7.50 | 7.00 | 21.00 | 1.250 | 12.5.000 | | | | | | |
| COUPLINGS | | 100.00 | | | | | | | 40 | | | | 500.00 | | | |
| PROTECTORS | | 100.00 | | | | | | | 5 | | | | 100.00 | | | |
| NIPPLES | | 100.00 | | | | | | | 5 | | | | 120.00 | | | |
| TOTALS | | | | | | $ 319.80 | | $ 1295.90 | | | | | $ 8225.25 | | $ 9840.95 | |

REMARKS:

Figure 3.—Is a sample of a standard cost computation sheet for a given size and finish of casing pipe.

# ARTICLES OF INTEREST

## TO INTERNAL AUDITORS

**Subject: STANDARDS OF EDUCATION AND EXPERIENCE FOR CPAs**

**By: Commission on Standards of Education and Experience for CPAs**

In April 1952, there was created a Commission on Standards of Education and Experience for Certified Public Accountants. The commission comprised an independent group on which accounting practitioners, schools of business and state boards of accountancy were represented.

The results of four years of study are covered in this 150-page report. Recommendations are divided between a long-range goal and a series of steps for a transitional period.

Five requirements are recommended as the long-range goal:

a. College education
b. A qualifying examination
c. A professional academic program at the postgraduate level
d. An internship program as part of the formal education
e. The uniform CPA examination

The majority of the Commission members believed that, when these requirements are established, the experience qualification which now exists in most states should be eliminated. However, during the transitional period, experience would still be required.

The general effect of the recommendations is to place the requirements for a certificate in public accounting on an almost entirely academic basis. There are several dissents from the recommendation, particularly in regard to the proposed elimination of the experience qualification. The statements of dissenting members are included in the report.

The Bureau of Business Research
University of Michigan Press
Ann Arbor, Michigan
Price $2.50

**Subject: HUMAN RELATIONS SKILLS CAN BE SHARPENED**

**By: Robert L. Katz, Assistant Professor of Business Administration, The Amos Tuck School, Dartmouth College**

Published in Harvard Business Review, July-August 1956

To assist industry and business to alleviate some of the suspicions and misunderstandings which are so prevalent in the field of human relations programs, and to appraise current programs properly Mr. Katz, in this article, has explored systematically what the objectives of training must be if real and lasting improvement in administrative performance is to result.

Major obstacles to effective administrative behavior are identified and a program is suggested which has proved useful in overcoming these barriers. It is a tough job to improve human relations skills—but not, as this article shows, an impossible one.

This formal program to improve administrative performance has four phases. 1. Preliminaries to better understanding: developing self-awareness and sensitivity to others. 2. Improve observation and analysis. 3. Preliminaries to better response, communication. 4. Improve decision making through practice.

"The real test of the success of the program is in the degree to which the man's performance in at least some of the following observable outcomes take place: 1. Increased productivity of the group for which the man is responsible, resulting in cost savings, improved quality, or increased profitability. 2. Improved understanding between the man and his superiors. 3. Greater insight into problems and improved judgment in predicting the results of proposed courses of action. 4. Increased readiness of the man to accept responsibility for the actions of his subordinates, admit errors not "pass the buck." 5. Greater willingness on his part to seek help in solving problems and initiating action, when necessary, even though those consulted be lower in the organization than he. 6. Accelerated growth and readiness for promotion of at least some of his subordinates. 7. Fewer grievances, lower turnover, and greater satisfaction with their jobs among his subordinates."

**Subject:** STATISTICAL SAMPLING FOR AUDITORS AND ACCOUNTANTS

**By:** **Lawrence L. Vance, Professor of Accounting, University of California.**
**John Neter, Associate Professor of Statistics, University of Minnesota.**

This book will provide a reader having little background in statistics with an introduction to the basic concepts of statistical sampling and to some of the statistical sampling techniques that are useful in auditing and accounting. The approach is toward the practical rather than the theoretical aspects of statistical sampling. The nature of auditing and accounting problems that must be solved before applying statistical sampling techniques is described, and alternative approaches to these problems are suggested.

A section of special interest to internal and external auditors is decision-making with statistical aids. This includes an introduction to statistical decision making, some important aspects of acceptance sampling plans, the choosing of an acceptance sampling plan from published tables, the calculation of acceptance sampling plans and related considerations, and problems in applying statistical acceptance sampling methods in auditing.

Another section deals with statistical sampling techniques as applied to estimation of quantitative characteristics.

Also covered are some of the organizational and operational problems that auditors will meet in applying statistical sampling techniques—such as, planning the audit, working papers for statistical procedures, and the training of staff members.

John Wiley & Sons, Inc.
440 4th Avenue
New York 16, N. Y.
Price $9.00

**Subject: THE FUNCTIONS OF A CLERICAL SYSTEMS GROUP**

**By: K. G. Belbeck, Staff Consultant, Stevenson and Kellog, Ltd.**

Published in Systems & Procedures, August 1956

"In the instances where clerical work is held up as an example of 'flagrant inefficiency' it is well, in evaluating an existing system to try to separate the inadequacy of the system from any maladministration."

The author illustrates with an example of a change made by engineers from Method A to Method B which was approved by management because of reduced cost estimates. As the reduction was not forthcoming, another engineer presented Method C. It was then realized by management that Method C was, to all intents and purposes, the discarded Method A. Neither engineer had realized that, if poor administration is rampant, the optimum effectiveness will never be reached—no matter what the method.

Ways of establishing terms of reference and composition of systems groups are discussed in the article. Evaluating proposals and what group reports should contain are outlined briefly, and several complex problems are presented to effectively challenge the thinking of the reader.

**Subject: S.E.C. ACCOUNTING—PRACTICE AND PROCEDURE**

**By: Louis H. Rappaport, Lybrand, Ross Brothers and Montgomery**

This book has been written to serve accountants and others faced with certifying financial statements intended for filing with the Securities and Exchange Commission. The organizational set-up of the S.E.C. and how it operates are described with emphasis on those divisions with which the practicing accountant should be familiar. For those not familiar with the S.E.C. review procedure, there is a description of how the staff of the Commission performs its principal functions under the Securities Act of 1933.

Opening chapters are primarily concerned with accounting practice and procedures under the 1933 and 1934 acts and include a listing of all registration statement and report forms that are currently in use, the time for filing, the type of information needed and the conditions relating to the use of the forms.

The rules of general application and those relating to consolidated statements under regulation S-X are covered in chapters 11 and 12. Industrial companies, electric utilities companies, a retail company, subsidiaries and foreign companies are used among others to provide specific illustrations of the application of regulation S-X.

The author goes into some detail on both sides of the question often asked of accountants by business men "What are the advantages or disadvantages of having securities listed on an exchange?"

Other topics covered in this comprehensive book are: Proxy statements, accountants certificates, independence of accountants, liabilities of accountants listing procedure and reports to stockholders.

The Ronald Press Company
15 East 26th Street
New York, N. Y.
Price $15.00

**Subject:** USE AND MISUSE OF EFFICIENCY CONTROLS

**By:** Frank J. Jasinsky, Institute of Human Relations, Yale University

Published in The Harvard Business Review

Today, perhaps too little is known of the problems that over-reliance on "efficiency control" can lead to. As important and useful as controls are, they need to be supplemented by other sources of information to be truly efficient. In more cases than not, so many "efficiency controls" are based on concepts of the 1920's and 30's that in one way or another the behavior of people on the job is conditioned by their almost single-minded observance of just two variables—pieces produced and man-hours expended. Also, it is sometimes possible to make reported efficiency look better by actions that actually aggravate major business problems.

In this searching article, Mr. Jasinsky points out the dangers (with case histories) of over-reliance on efficiency controls that include only quality, tool costs, inventory levels and production schedules. He suggests such corrective action as re-evaluation and re-education by: "(1) making an inventory of existing accounting reports; then taking a critical look at them to determine exactly what they do and do not reveal. (2) Determining what information is required to make certain decisions, and what portion of this information can be supplied by existing or additional accounting reports. (3) Developing non-accounting sources and channels for information required for decisions."

Mr. Jasinsky relates that the development of non-accounting sources and channels of information is perhaps the most vital step in any remedial program. He believes that it would be advantageous to management to treat accountants as the helpful counselors that they could be rather than as the final figures that they have never been.

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This employment section is offered as a service to members and others who may be seeking employees or who may be interested in new employment. All replies should be addressed to the advertiser—if the name is given—or addressed to The Institute of Internal Auditors, 120 Wall Street, New York 5, N. Y., with reference to the Box "E" number. Space rate on request.

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**Ronald Press—15 E. 26th Street, New York 10, N. Y.**

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